THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVI. No. 1426.] LONDON, SEPTEMBER 9, 1890. [42ND YEAR. Price 6d.

Ashmore, Benson, Pease, & Co., Ltd.

GASHOLDERS.
CONDENSERS.
SCRUBBERS.
PURIFIERS.
RETORT-APPLIANCES.
CONSTRUCTIONAL IRONWORK.
DAVIS'S AMMONIA STILLS.

STOCKTON-ON-TEES.

Illustrated Gas-Works Catalogue.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

WOLSTON'S
TORBAY PAINTS
Special Quotations to Gas Companies.
23, GREAT GEORGE ST., WESTMINSTER, S.W.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.

Office: 7, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

C. & W. WALKER.

GASHOLDERS; PURIFIERS;
PURIFYING MACHINES;
CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;
SULPHATE & SULPHUR PLANT;
RETORT MOUTHPIECES; CONDENSERS;
LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;
SLIDE VALVES; TAR BURNERS; &C. &C.
WOOD SIEVES.

ADDRESSES: 8, Finsbury Circus, London, E.C.; Midland Iron-Works, Donnington, near Newport, Shropshire.
"FORTRESS LONDON," "FORTRESS DONNINGTON,"—Telegraphic.

SAWER AND PURVES,

LATE

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER,

Manufacturers of

IMPROVED CONSUMER'S WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

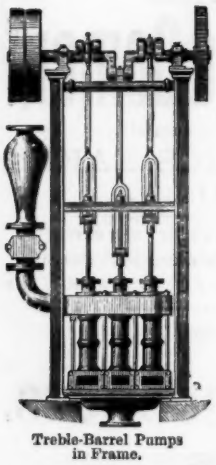
AND

IMPROVED DRY GAS-METERS;

Also Sole Makers of THORP AND MARSH'S PATENT CASH PREPAYMENT ATTACHMENT FOR GAS-METERS.

STEAM & HAND PUMPS FOR GAS-WORKS.

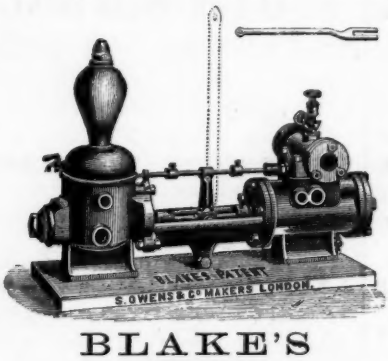
FOR PUMPING TAR, WATER, AND LIQUOR.



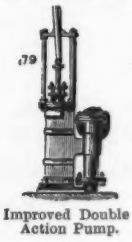
Treble-Barrel Pumps in Frame.

Syphon Pump.

Double-Barrel Force-Pump in Frame.



BLAKE'S
PATENT
STEAM PUMPS.
20,000 IN USE.



Improved Double Action Pump.

Cast-Iron Hand-Pump.

Wrought-Iron Portable Pump.

S. OWENS & CO., Hydraulic, Gas, & General Engineers, WHITEFRIARS ST., LONDON, E.C.

SOLE MANUFACTURERS OF

MANN & OWENS' PATENT SCREW & CAM, also FULL-WAY RACK & PINION GAS-VALVES.

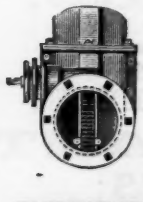
S. O. and Co.'s New Catalogue of Gas Apparatus and General Machinery can be had on application.

NEWTON, CHAMBERS, & CO., LIMITED,

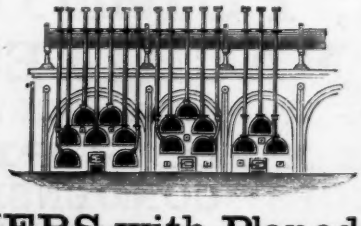
THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

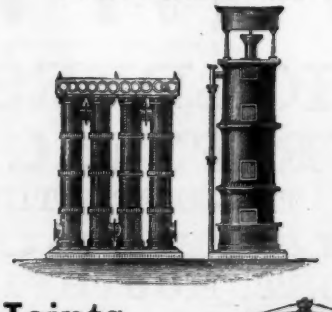
SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.
GASHOLDERS,
AND
Gasholder Tanks.



CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

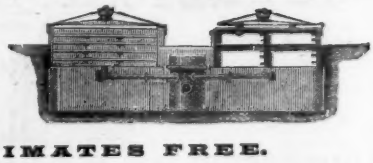


WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.



PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

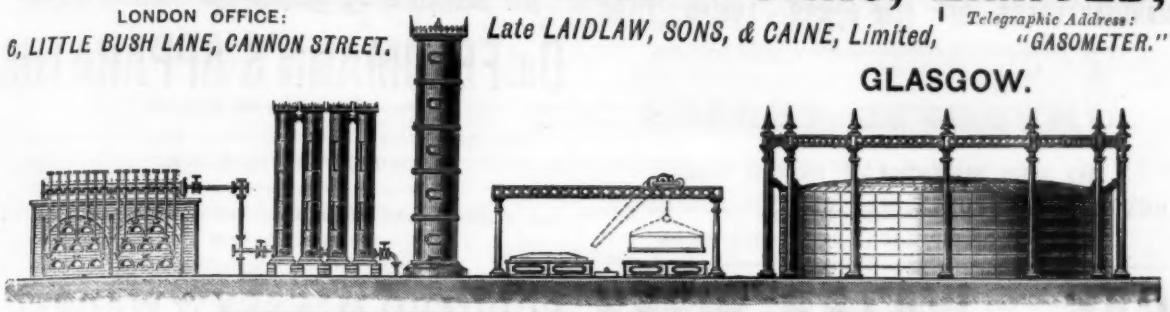
THE BARROWFIELD IRON-WORKS, LIMITED,

LONDON OFFICE:
6, LITTLE BUSH LANE, CANNON STREET.

Late LAIDLAW, SONS, & CAINE, Limited,

Telegraphic Address:
"GASOMETER."

GLASGOW.



MANUFACTURERS OF ALL KINDS OF GAS PLANT.

RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
PURIFIERS, WITH PLANED AND CEMENT JOINTS;
DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT IRON TANKS;
STATION METERS; GOVERNORS; SCREW AND RACK VALVES;
FOUR-WAY COCKS AND HYDRAULIC VALVES;
CAST-IRON GAS, WATER, & STEAM PIPES & CONNECTIONS; WROUGHT-IRON TUBES & FITTINGS;
IRON ROOFING, MARKET BUILDINGS, BRIDGES, GIRDERS, STEAM BOILERS;
PROMENADE PIERS AND LOADING WHARVES.

MANUFACTURERS OF OIL PLANT OF EVERY DESCRIPTION.

HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

DESCRIPTIVE SPECIFICATIONS AND ESTIMATES ON APPLICATION.

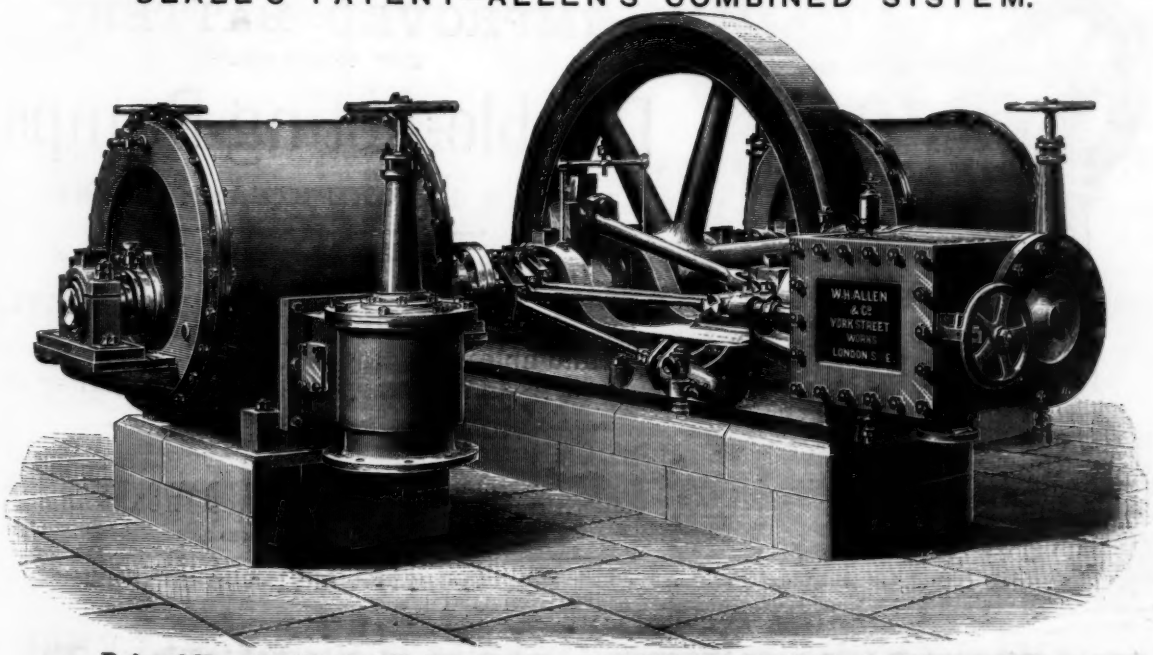
W. H. ALLEN & CO.,

York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
C X O	"JACKSON"	BECK & Co.
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

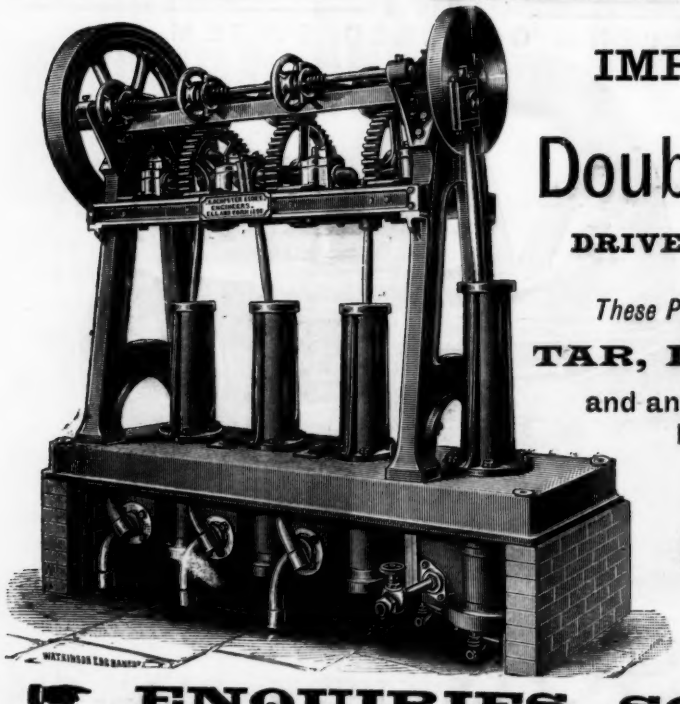
And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

R. DEMPSTER & SONS, Ltd.,

GAS, CHEMICAL, & HYDRAULIC ENGINEERS & CONTRACTORS,

ESTABLISHED — **ELLAND.** — 1855.



IMPROVED BATTERY

OF THREE

Double-Acting Pumps

DRIVEN BY ONE STEAM-ENGINE.

These Pumps are fitted with Valves for pumping

TAR, LIQUOR, and WATER,

and an arrangement by which any of these Liquids may be pumped together or separately.

BEST MATERIALS AND WORKMANSHIP,

AND

EFFICIENCY GUARANTEED.

ENQUIRIES SOLICITED.

RETORT SETTINGS IMPROVED

BY ADOPTING

THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.

HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

J. & H. ROBUS,

CONTRACTORS FOR GAS AND WATER WORKS,

20, BUCKLERSBURY, LONDON, E.C.

WILLEY & CO.,

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

London Offices: 6 & 7, KING WILLIAM STREET, E.C.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS,

GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

CHEAP STEAM — FOR — GAS-WORKS.

MASON'S PATENT FURNACE

Can be applied to any kind of Boiler.

It improves the draught.

Economises time in raising steam.

Gives steam quickly at any pressure.

THE

ONLY FUEL

recommended is

COKE DUST,
COAL DUST,
CINDERS,
SAWDUST,
BREEZE,

Or any other Refuse Fuel.

W. F. MASON, *ENGINEER and PATENTEE,* Longsight, MANCHESTER.

CAST-IRON PIPES, ETC.

THOMAS SPITTLE, LTD.

[ESTABLISHED OVER 50 YEARS.]

CAMBRIAN FOUNDRY, NEWPORT, MON.,

MAKERS OF

CAST-IRON PIPES FOR GAS, WATER, AND STEAM.

ALSO

Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

ALSO ALL WROUGHT-IRON WORK.

THE LARGEST MAKERS IN WALES.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

IMPORTANT ANNOUNCEMENT.

Messrs. Robert and John Dempster beg to announce that they have made arrangements with Messrs. Gadd and Mason and the Patent Gasholder Syndicate to manufacture and erect their PATENT COLUMNLESS GASHOLDERS.

ALL COMMUNICATIONS TO BE MADE TO

R. & J. DEMPSTER,

Gas Plant Works, Newton Heath, Manchester,

OR TO

THE PATENT GASHOLDER SYNDICATE,

504, STOCKPORT ROAD, MANCHESTER.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.

WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

LIVERPOOL:
16, Lightbody Street.

LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET,
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA
STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY
OF

GASHOLDERS,

AND
MAKERS
OF

REG? TELEGRAPHIC ADDRESS:
"GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

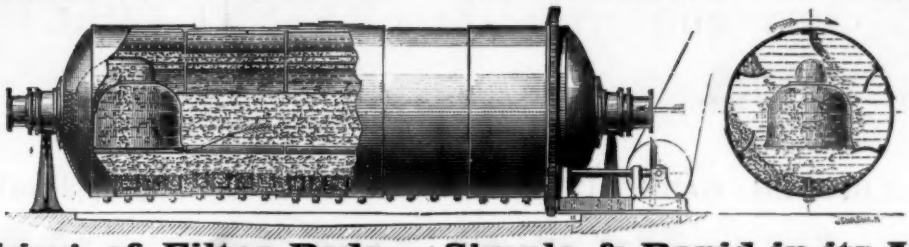
MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

WATER PURIFICATION.

RIVER WATER and SEWAGE EFFLUENT successfully and economically treated in large volumes, by AGITATION WITH METALLIC IRON in

ANDERSON'S PATENT REVOLVING PURIFIER.



No Choking of Filter-Beds. Colour due to Peat and Clay entirely Removed.

Simple & Rapid in its Action. Organic Matter Considerably Reduced.

Microbes Totally Removed.

Made in Fourteen Sizes, capable of treating singly from **4000** to **1¼** Million Gallons daily.

REVOLVING PURIFIER COMPANY, LIMITED,

DOCK HOUSE, BILLITER STREET, LONDON, E.C.

ASHMORE, BENSON, PEASE, & Co., Ld.,

GAS PLANT MANUFACTURERS,

STOCKTON-ON-TEES,

SOLE MAKERS OF

DAVIS'S PATENT AMMONIA STILLS, which are the cheapest and most effective in existence.

Sole Makers of **GREEN'S PATENT SCREENS FOR SCRUBBERS.**

Makers of **SOMERVILLE'S PATENT DIP REDUCERS.**

HASLINGDEN GASHOLDER, 80 ft. by 22 ft., showing application of

PEASE'S

PATENT WIRE-ROPE GUIDING.

In adding second and third lifts to present holders, it effects a great saving in cost, and vastly increases the storeage.

The Manchester Corporation have the third lift of a 100 feet holder working by this System.

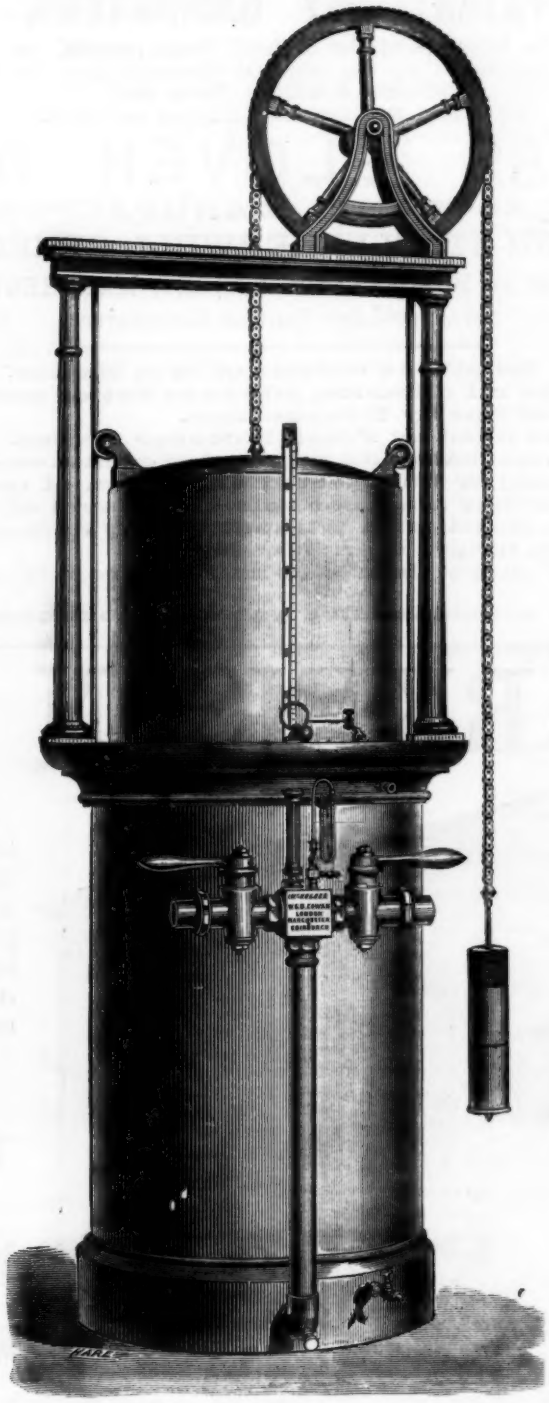
PEASE'S WIRE ROPES have been also adopted by two other Companies for completely new telescopic holders.

W. & B. COWAN'S

GOVERNMENT STANDARD

TESTING GASHOLDERS.

The Cycloid is dispensed with, as being both troublesome and unnecessarily complicated, and far less reliable in action than the compensating counter-balance chain, with which these Testing Gasholders are fitted.



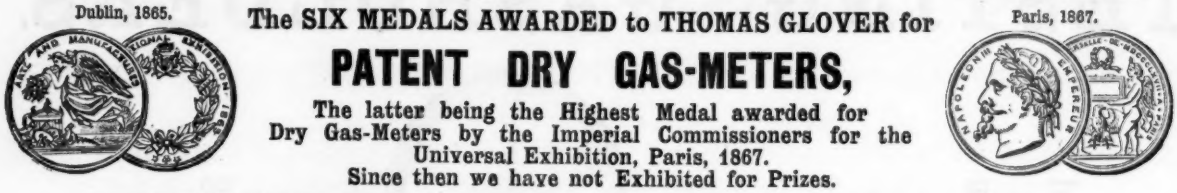
Prices and Particulars of the various Sizes furnished on application.

SMITH SQUARE WORKS, WESTMINSTER, LONDON, S.W. | DUTTON STREET WORKS, MANCHESTER. | BUCCLEUCH STREET WORKS, EDINBURGH.

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

W. PARKINSON & CO.

NEW DESIGN STATION METER.

W. PARKINSON & CO. have introduced this design of Station Meter in order to meet the demand for a more ornamental Tank. All joints are planed, the most modern improvements introduced, and the entire Meter is of the strongest and most substantial description.

FITTED WITH

Parkinson's Patent

THREE-PARTITION

MEASURING DRUM.

HIGHEST AWARD, MELBOURNE EXHIBITION.

MATERIALS and WORKMANSHIP of the VERY BEST QUALITY ONLY. PRICES, &c., ON APPLICATION.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."
[See also Advt., p. 580.

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

Two Congresses . . . 535
The Address of the President of the British Association . . . 536
The Balloon Society on the London Gas Supply . . . 536
An Old Error Revived . . . 537

WATER AND SANITARY AFFAIRS—
The Price of water in the Metropolis . . . 537
The Disposal of London Sewage . . . 537

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market . . . 538
Electric Lighting Memoranda . . . 538
A New Residual . . . 539

COMMUNICATED ARTICLE:—

The Valuation of Gas-Works for Assessment. By Thos. Newbigging, M. Inst. C.E. . . . 541
Street Watering with Sea Water. By a Seaside Water Inspector . . . 541

TECHNICAL RECORD:—

Cloudsley's Cash-Value Indicator for Gas-Meter Indices . . . 542
The Meeting of the British Association—Sir Frederick Abel on the Progress of Science . . . 543
North British Association of Gas Managers—The Annual Meeting at Perth—Official Report of the Proceedings . . . 544
Paper by Mr. G. Little on the Transit of Materials in Gas-Works . . . 551
Manchester District Institution of Gas Engineers—Quarterly Meeting in Lancaster—General Report . . . 547
Illuminants Employed in Paris . . . 549

REGISTER OF PATENTS:—

Improving the Illuminating Power of Lighthouses and other Places—Wigham, J. . . . 552
A Lock Stopcock for Gas and Water Supply—Ashton, J., Wormald, A. H., and Ashton, A. . . . 552
Charging and Drawing Gas-Retorts—Somerville, J., and Cutler, S. . . . 552
Gas-Engines—Green, W. H. . . . 553
Water-Waste Preventers—Streeter, F. S. . . . 553
Manufacture of Illuminating Gas—Pitt, S. (Jerzmanowski, E. J.) . . . 553
Patent Notices . . . 554

CORRESPONDENCE:—

Mr. Gadd's Gas Institute Paper and Mr. Cripps's Criticism . . . 554
The Brin Oxygen Process and the Suppression of Effluvia from Gas-Works . . . 554
Mr. Dobbs's Charge against the Southwark and Vauxhall Water Company . . . 554
The Hypothetical Tenant . . . 555
Increase in the Bristol Gas Directors' Remuneration . . . 555

MISCELLANEOUS:—

Next Year's Examinations in Gas Manufacture . . . 555
Manchester Gas and Water Departments—Abstracts of Accounts . . . 555
Leeds Corporation Gas Supply—The Cost of the Recent Lockout; Another Dispute with the Men . . . 556
Lancaster Corporation Gas and Water Supply—The Gas Manager's Annual Report—The Accounts of the Water Department . . . 556
Paisley Corporation Gas Supply—The Past Year's Working; The Disposal of the Surplus . . . 557
The Public Lighting Question at Sheerness . . . 557
Provincial Gas and Water Companies . . . 558
Meeting of the Tottenham and Edmonton Gas Company . . . 559
The Gas Supply of London—Laymen on Gas Companies and Gas Manufacture . . . 560
The Sanitary Congress at Brighton . . . 561
The Padiham Local Board New Water-Works . . . 563
Lead-Poisoning from Drinking Water—A Discussion before the British Medical Association . . . 563
Notes from Scotland . . . 564
Current Sales of Gas Products . . . 565
Gas and Water Companies' Stock and Share List . . . 567

PARAGRAPHS.—Mr. T. Tyrer, 538—The Welsbach Incandescent Gas-Light, 538—Mr. Herbert Andrew, 539—The Testimonial to Mr. George Livesey, 539—The Wenham Company, Limited, 540—Potts's Mining Register and Directory, 540—Local Authorities and Gas Undertakings in South Australia, 540—"Arithmetical Physics" 542—Railway Rates for Merchandise, 551—Mr. John Sledden, 552—Eastern Counties Gas Managers' Association, 552—The Water Supply to Brewers at Preston, 554—Collapse of a Reservoir at Castleford, 554—Stoppage of the Oxford Water Supply, 555—The Purchase of the Douglas Water-Works by the Corporation, 557—The Whitehaven Trustees and the Gas Company, 559—Discovery of Fresh Sources of Natural Gas at Pittsburgh, 561—The Bridgetown (Barbados) Water-Works Company, 562—The Clonmel Water and Sewerage Works, 562—Liverpool Corporation Water Supply, 563—The Manufacture of Sulphate of Ammonia in Gas-Works, 565—The Dangers of Electric Lighting, 565—The Ystrad Water Company Summoned, 565—Gas and Electric Lighting Affairs at Dublin, 565—The Deacon Waste-Detecting Meter at Andover, 565—A Pennyworth of Gas, 565—The Wigan Corporation Water-Works, 565—A New Water Reservoir for Efland, 566—The Quality of the Water Supply of Farnham, 566—Oil *v.* Gas Lighting at Monmouth, 566—Gas *v.* Electric Lighting at Lewes, 566—The Finances of the Belfast Corporation Gas Committee, 566—Gas Workmen's Excursion, 566—The Northern Coal Trade, 566—The Newark Corporation and the Purchase of the Water-Works, 566—Lead-Poisoning in the West Riding, 566—Shipley and the Water Supply of Windhill, 567—The Strike of Gas Stokers in Melbourne, 567—Lubricants and Machinery Oils, 567—Shrewsbury's Heating Appliances, 567—The Closing of the Electric Lighting Station at Cardiff, 567—Matlock Bath Water Supply, 567—The Eccup Reservoir of the Leeds Corporation, 567—The Effect of Nitrates and Lime in Potable Water, 567—The Burnley Gas Committee and Inclined Retorts, 567—Proposed Purchase of the Selby Gas-Works by the Local Board, 567.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Telephone Number: 2759.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 9, 1890.

Two Congresses.

Two notable congresses have met daily during the past week, one in Leeds and the other in Liverpool; and public attention has been divided between them. It would not be quite correct to describe the Leeds assembly as consisting of wise men; for fools are of a ubiquitous genus. Still less justice would there be in characterizing the Liverpool meeting as that of the unwise, for many of the associated Trades Unionists are worthy and sensible men. Yet it ought to be supposed that there is more wisdom and knowledge to the cubic foot in any place selected for the annual meetings of the British Association than could be found at the same time in any other locality. It is a poor British Association meeting that does not afford the world of English newspaper readers a standard for measuring the progress of human knowledge in some one or another of its multitudinous developments. The addresses of the Sectional Presidents may generally be depended upon for setting the "time of day" in two or three branches of science; and this year's meeting is no exception to the rule. Particularly may it be said that the address of Professor Alfred Marshall, of Cambridge, to the section of Economic Science is deserving of attention at this time, when the Industrial Body and the Body Politic are being quacked by charlatans of every known breed. There is something striking in the fact that at the very season when the Trades Unionists were turning their hall of meeting in Liverpool into a bear garden, while engaged in the fascinating process of passing resolutions for reconstructing the universe on Trade Union principles, the calm utterances of knowledge were making themselves heard from Leeds. Mr. John Burns domineered over the Trades Union Congress by virtue of a loud voice and limitless assurance; and he and his party of Opportunist Socialists succeeded in obtaining a vote in favour of taking steps to obtain an eight-hour day by Act of Parliament. Men like Burns and Thorne are always "cock-sure" in their own conceits. They have not the slightest doubts concerning their own cleverness and the folly of everybody else in the world. Give them their own way, and they will engage to banish poverty, crime, and misery from the earth. Like all such men, their wonder-working is to be done by the simplest means. The medical quack has but one pill for curing all diseases; and the Opportunist Socialist can think of but one way of regenerating society, which is by passing an Act of Parliament. He has never heard of Acts which are dead letters. Give him his Act, and he promises to abolish all the ills to which humanity is heir. If his belief in his own infallibility and the omnipotence of Acts of Parliament is not a pretence, what a pity it is that his education stops so lamentably short! With increase of knowledge there always come less confidence in self and certitude as to the correctness of one's opinions. While the Burnses and the Thornes keep vapouring away about their legislative eight-hour day, Professor Marshall promulgates his conviction that "every year economic problems become more difficult; "every year it is more manifest that we need to have "more knowledge, and to get it soon, in order to escape, "on the one hand, from the cruelty and waste of irresponsible competition, and the licentious use of wealth, and "on the other from the tyranny and the spiritual death of "an iron-bound Socialism."

The best friends of the workman must have read with pain the reports of the Trades Union Congress. That the meetings were extremely noisy, and many of the speeches deficient of that urbanity which is so desirable in debate, is not a very great matter. One can overlook almost any amount of roughness of speech and manner in a man whom one recognizes as being of sterling worth. If the Trades Unionists at these Congresses only spoke the truth, and acted in a true public spirit, one could pardon their turbulence; but unfortunately there is a vast amount of downright humbug in their congressional proceedings. Take, for example, the clamour for a legislative eight-hour day. This matter was discussed and voted upon by the Congress; and yet there was not a single valid argument advanced in favour of such a radical departure from the customary way of regulating industrial questions, or one speech delivered in order to show that the gravity of the change was appreciated by those who professed to demand it. The whole business was John Burns's, who, as we have already stated, domineered over the whole Congress, much to the disgust of many of the delegates. John Burns professes Trades Unionism; but scratch the skin of his Unionism ever so slightly and Red Communism and Socialism is quickly revealed. Some of the members of the Congress were ready to shout for a six-hour day; and a few doubtless would like a *régime* of all pay and no work. The proceedings of the

Congress, if they meant anything at all, symbolized what one speaker called the "Religion of Trades Unionism." To many members of the Congress there can be no doubt that Trades Unionism represents the only religion they can understand. It has succeeded to the prerogative of a Cult—that its tenets, even when pushed to their extremest developments, are not to be reasoned upon, but must be implicitly accepted and obeyed. Thus, while some trading firms were censured in the Congress for not paying the full Union rates of wages, others were equally blamed for paying more. The "contract system" was condemned, because it induces employers to search out the quickest workmen, and to pay them more money than can be earned by those men who practise only the "Union stroke." Thus we have not had long to wait for something like an official endorsement of the dictum laid down in these columns some months since—that the less work a man does in a day, the better Unionist he is. This is one of the fundamental tenets of the Trades Unionist faith, which it is sought to enforce by Act of Parliament. The idea would be ludicrous if it were not so deplorable.

It is saddening to see the budding energies of Associated Trades Unionists so misdirected, because there is quite enough work for them to attend to of a more useful sort. The factory and sanitary laws require enlargement and improvement; and outside Parliament it would be of assistance to statesmen if members of the working classes would themselves investigate, with their special knowledge, the causes of some of the industrial evils of which they complain, before attempting to cure the most obvious results by a quack remedy. So long as crude socialistic ideas, such as that of the establishment of municipal workshops, continue to amuse Trade Unionists, the statesman must shake his head over their recommendations. Committing their organization to projects of legislation like that of the eight-hour day will only make the Trade Unionists an easy prey for party politicians, who, seeing that their programme is not likely to be speedily carried out, will engage to uphold it in return for support for more pressing measures. Thus the Labour Party will be kidnapped before it has learnt to stand alone. Some of the wiser Trade Unionists perceive the danger, but are powerless to avert it so long as their thoughtless comrades run after the Will-o'-the-Wisps called into appearance by the leaders of what is sometimes named the New Trades Unionism, but which we prefer to designate Opportunist Socialism, which is merely Communism with its face washed and its dynamite hidden until a more convenient season.

The Address of the President of the British Association.

THE British Association for the Advancement of Science met in Leeds last Wednesday, when Professor Flower resigned the presidentship to Sir Frederick Abel, the world-renowned Chemist to the War Department. The phrase we have used to characterize the name of the new President is peculiarly apposite, for the name of Abel is probably most generally known in connection with the standardizing of mineral oils for illuminating purposes. Petroleum is sold under the Abel test all over the world; and it would be difficult to overrate the services conferred upon humanity by Sir Frederick in rendering lighting by the cheaper mineral oils practically safe. It would be unfair to the President of the British Association, however, to overlook his other claims to recognition as one of the most successful workers in chemistry of his time. The circumstances of his appointments under Government have constrained Sir F. Abel to be, on the whole, severely practical. He has had but little time for pondering over the abstractions of theoretical chemistry; having to keep up with the developments of the petroleum industry, the manufacture of explosives, and other hard actualities of a progressive civilization. That portion of the community which is interested in questions of artificial lighting should remember the name of Abel not only on account of his work in connection with illuminating oils, but also for his researches into explosions in coal mines, which definitely established the truth with regard to the influence of coal dust upon such explosions; and for his inquiry into the causes of spontaneous combustion in coal cargoes. In effect, Sir. F. Abel's position with regard to the modern development of the trade in, and the application and handling of, explosive commodities has been that of an Official Regulator. His office has thus been for many years a post of difficulty and responsibility, requiring from the incumbent much mastery in science, and, above all, a great share of common sense. Whenever an inventor has brought out a new explosive, whether for warlike or peaceful uses, or whenever a new lighting agent or fuel, capable of exploding, has been put upon the market, it has usually been Sir F. Abel's task to determine the conditions under which the novel commodity might be safely used. It is needless for us to declare how prudently and efficiently this duty has invariably been discharged. Sir F. Abel is a good specimen of a type of the man of science of which this country may well be proud—learned enough for anything, yet fully alive to the every-day requirements of life. Entertaining this high opinion of Sir F. Abel's character and attainments, we must express disappointment with his address as President of the British Association, which was a prolix, diffuse, and objectless composition. Electricity formed its chief topic; and since Sir F. Abel is no great electrician (although, of course, he has had to keep himself posted in what electricians have done), the selection of this much-debated theme for his address gave it a good deal of the air of an ordinary lecture to a Mechanics' Institute. Reference was made by Sir F. Abel to electric lighting; but what he had to say on this branch of the subject was neither novel nor suggestive. He told his auditory that the Leeds Corporation had gone in for a little electric lighting, and that nine Electric Lighting Companies either are or will shortly be doing active business in London. He claimed for these Companies that even now this method of lighting can be provided by them at a cost "which does not preclude a considerable section "of the public from enjoying the decided advantages pre-"sented by electric lighting over illumination by coal "gas." It will strike most readers of this eminently safe remark that it is not a particularly brilliant sample from a British Association address. Upon the subject of the electrical transmission of power, moreover, Sir F. Abel did not seem to be much more at home. He dwelt upon the predictions of the late Sir W. Siemens in this connection; but advanced nothing that a diligent reader of the scientific and technical press of England and America during the past few years could not recognize as familiar. In dealing with natural gas and water gas also Sir F. Abel trod only upon well-worn ground. Where he spoke of explosives used in warfare and for blasting purposes, he may be considered to have displayed more of the quality of an expert, and to have exhibited more of authority in his comments; but, upon the whole, it will probably be the general opinion that the British Association Presidential Address for 1890 partook too much of the character of a review of contemporary science couched in popular language, and is therefore lacking in that distinction which some former Presidents have known how to impart to their orations from the chair. It is not given to everyone, however, to be a good worker and an eloquent speaker; and while Sir F. Abel is so favourably known for his work, it would be ungracious to complain that he is not an ideal scientific orator.

The Balloon Society on the London Gas Supply.

As will be seen from our special report in another column, a Mr. Edmund Kimber has been enlightening the world, through the medium of the Balloon Society, on the subject of the Gas Supply of London. Not all our readers may perceive at the first glance the appropriateness of an address upon gas supply when delivered at a meeting of a Society devoted, according to its title, to the navigation of the air. It is not our duty, however, to defend the Society in its wanderings from ballooning to gas supply; although it may be thought that since balloons are of no use without gas for inflating them, the subject of gas making is not quite so foreign to the general study of ballooning as some others that might be named. Yet it was not on account of its special usefulness to aëronauts that Mr. Kimber brought coal gas under the notice of the associated balloonists. He approached them as gas consumers of the ordinary type, and entertained them with matter relating to the financial and other aspects of the London gas industry which may be supposed to concern balloonists as much as less volatile citizens and ratepayers. We believe that, as a matter of fact, the members of the Balloon Society have not much to do with simple ballooning, which is at present a somewhat acrobatic pursuit, associated in most people's minds with outdoor *fêtes*

and similar scenes of unscientific diversion, although a more serious application of balloons is occasionally heard of in connection with military manœuvres. Figuratively speaking, however, Mr. Kimber and most of his hearers seemed to get very far "above the clouds" when they pretended to talk sagely about the gas supply of London. Mr. Kimber's own particular reason for essaying to deal with the subject soon appeared in what was evidently meant to be an artfully insidious advertisement of the Avery oil and water gas system. But this appeared to be too much for the President of the Society (Mr. W. H. Le Fevre), who quietly ignored Mr. Kimber's zeal for the Avery system, and turned the attention of the meeting upon the question of the desirability of London ratepayers acquiring the gas undertakings of the Metropolitan Companies, and working them through the County Council. This was a perfectly safe turn to give to the discussion of Mr. Kimber's paper, inasmuch as the question is at present, and most likely will remain, of purely academic interest. Mr. Le Fevre passed his resolution, however; and possibly in the dim future, when the County Council enters into the inheritance he thus marked out for it, his name will be cited by a few surviving balloonists as that of a pioneer in the great movement. The least the County Council could do, by way of acknowledging the services of the Balloon Society in helping it to the control of the London Gas Supply, would then be to promise free gas for their aëronautical experiments. This would have the merits of sounding large and yet costing nothing.

An Old Error Revived.

THAT "history repeats itself" is a saying which all have heard so often that it has become one of the tritest of commonplaces; yet whenever its truth is exemplified afresh, we are unfailingly amazed. Students of the early records of gas lighting are generally diverted by the chronicle of Winsor's extravagancies, particularly that one of his assertion of the benefits to health derivable from inhaling a mixture of coal gas and air. They are apt to wonder how any man could have been permitted to talk in this way in any age without running grave risk of being arrested as a lunatic, and are fain, for want of better explanation, to conclude that it was the ignorance of their forefathers that protected the historical coal gas "promoter" in his exaggerations. Unfortunately for the self-complacence of the young men of the present age who may be inclined to hold this view, news has come from the United States—that home of progress—which goes to show that there are as great fools now as ever there were "when George the "Third was King." What else are we to think of the intelligence published by our contemporary, the *American Gaslight Journal*, of the formation, in the town of New Bedford, Massachusetts, of an organization called "The People's "Non-Explosive and Sanitary Gas Company," intended to manufacture and supply an illuminating gas, the discovery of General Eugène de Beauharnais, which is not only inexplosible and excessively cheap, but is also possessed of medicinal qualities? This gas is reported to be made from petroleum, air, and water, in the proportions, as stated, of "one barrel of crude petroleum to 10,000 cubic "feet of air, and a very little water." A trifle more precision as to the respective quantities of these ingredients, which are so divergent in nature and so different in price, might have been desired; but this is merely a detail. Questions of composition sink into insignificance when one can be assured that the gas "can be "inhaled with great benefit by persons suffering with "throat or lung trouble," and that somebody has been nearly cured of cataract by allowing the gas to flow for a certain time daily for three weeks over the affected organ. Shade of Winsor! hast thou emigrated to New England, and there found a convenient opportunity for reincarnation? What alarming possibilities are foreshadowed in this thought! Is the spirit of Humbug immortal, and do even its forms reappear at stated intervals upon the earth, to the deception and loss of the simple from generation to generation? It appears so; but fortunately we are permitted, by the evidence, to believe that the mischief becomes attenuated with each reproduction, like true Pasteur's germs in their ameliorating culture-fluids, and therefore that this New Bedford project will neither live long nor go far.

WATER AND SANITARY AFFAIRS.

THE price of water has been made the subject of a discussion in *The Times* between Mr. George Kebbell on the one hand, and Mr. Archibald E. Dobbs and Mr. R. C. Halse on the other. We apprehend that, in the case of the Metropolis, the fairest way of getting such an estimate as the one proposed, is to compare the net water-rates with the amount of population. Taking the figures given in Mr. Lass's "Analysis," we find that in 1888 the population was 5,333,150; while the net water-rates—that is to say, the actual sum paid by the consumers—was £1,728,760. The discussion in *The Times* relates to the amount paid per head per week. It will be seen that this is rather less than 1½d.; and for that amount, there is a supply of more than 200 gallons. If we reckon according to the profit which accrues to the Companies after all charges are paid, the sum to be dealt with is reduced to £927,502, or a fraction more than ¾d. per head per week, for the above quantity of water. It fortunately happens that Mr. Kebbell has called attention to the existence of the public rate which supplements the domestic water-rate in some of the towns where the supply belongs to a municipal authority. In Manchester, the domestic water-rate is 9d. in the pound; and this makes the supply look cheap. But there is a public water-rate of 3d. in the pound. This makes the total water-rate look like 1s. in the pound. But in reality it is more; for, as Mr. Kebbell points out, the domestic rate of 3d. produces the same amount as the public rate of 9d. So that the ratepayers of Manchester really pay 1s. 6d. in the pound for their water supply, or 50 per cent. in excess of the amount paid in London. In Liverpool the result is substantially the same, with the addition that the Corporation receive 5s. 10d. per 1000 gallons for water for shipping, as against 6d. in London. It is worthy of notice that the Royal Commission appointed in 1866, in recommending that the Metropolitan Water Supply should be transferred to a responsible public body, also advised that "there should be a power of levying, as at Man- "chester, Glasgow, and elsewhere, two rates—one a "special or domestic rate upon all dwelling-houses, the "other a public or general rate on all rateable property." If ever the water supply of the Metropolis passes into the hands of the London County Council, or a body of Water Commissioners, there can be no doubt that this power of levying a public or general rate "upon all rateable pro- "perty" will form part of the scheme. Warehouse property in the City will then have to pay not merely much for consuming little water, but a large amount even though the sole supply be obtained from a private artesian well. It will be a grand result to see the model lodging-houses of the Corporation in Petticoat Square, paying a public water-rate of 9d. in the pound, while the buildings are supplied from the well which the Corporation are sinking at their own cost. Mr. Dobbs, who is carrying on his battle against the Water Companies from the appropriate locality of Dorking, has probably lost sight of this contingency. We ask him in future to bear in mind the relation between "rateable "value" and a public water-rate. In reference to the letter which this gentleman has addressed to us, and which will be found in another column, our remarks for the present must be brief, as the communication has been somewhat late in reaching us. It may suffice just now to say that we should have no objection to publish the whole of the written *addendum* to Mr. Dobbs's printed letter on the "cutting-off" case, if doing so could be shown to answer any particular purpose. As for the objections to the County Court process where water-rates are in default, we have already signified that the method is not so "imme- "diate and direct" as to afford sufficient protection to the Water Companies, and that, if generally adopted, "de- "faulters would be multiplied a hundredfold." If further explanation is necessary, we will give it.

The letter addressed by Major Rasch to the *Standard*, to which we referred last week, concerning the disposal of the London sewage, has been followed by other communications on that contentious topic. Colonel Jones, famous for his success in dealing with the Wrexham sewage on the irrigation principle, and well known as associated with Mr. Bailey Denton in the Canvey Island scheme, advocates his favourite project, and declares that the Vicar of Canvey rather likes the idea, though it is a long road to the end of the hundred years when the whole island is to become "solid, rich agricultura land, all above the level

"of the highest tide, instead of remaining, as at present, "some 8 feet below it." So much for the virtues of London sludge—an article which at present is thrown into the North Sea. But Major Rasch finds an ally in Mr. Lloyd Wise, who is a County Councillor for the South-end division of Essex. He has the same local antipathy as Major Rasch to the "proposed devolution" of the London sewage on Canvey Island—a spot which he considers to be less than four miles distant from Southend. Both Leigh and Southend are determined to resist the adoption of any such plan as that proposed by Colonel Jones and Mr. Bailey Denton. Following in the same track is Mr. Thomas Ellis, who presumably has no particular interest in Southend or Leigh, but who, a quarter of a century ago, made vigorous efforts to obtain possession of the London sewage south of the Thames. This gentleman cites some evidence given in 1864 by Mr. George Hopkins, C.E., who condemned the scheme of Messrs. Napier and Hope, for utilizing the London sewage on the Maplin Sands. Mr. Ellis uses this evidence to show that if the London sewage is conveyed to Canvey Island, the whole water supply of the surrounding district will be ruined. Objection is thus taken to the scheme as being not only preposterous but "murderous." Still, after all, something must be done with the sewage; and we turn once more to Mr. Richard F. Grantham, M. Inst. C.E., who, as we mentioned last week, read a paper on the subject of the London sewage at the recent Congress of the Sanitary Institute. Mr. Grantham discards the proposed chemical treatment at Barking and Crossness; his conclusion being founded on the strong consensus of opinion against the process, and, indeed, against any chemical treatment of the London sewage. He also objects to the notion of purifying the sewage by applying it to land. The volume to be dealt with is so large as to create peculiar difficulties in respect to filtration or irrigation. At least 10,000 acres would be required; and, of course, this is next to impracticable in the vicinity of the Metropolis. In the next place Mr. Grantham gives force to the objections urged against discharging an effluent from the sewage, chemically or otherwise treated, at Hole Haven or Canvey Island. But he admits the plea that the deposition and filtration of the sewage on the Maplin Sands would afford all the advantages claimed for Canvey Island, without the drawback of annoying Southend. Also, instead of a fertile tract being rendered valueless for agricultural purposes, a piece of land will be actually added to the county of Essex, such as may be made exceedingly fertile and valuable. The conduit to the sands would be covered all the way, and would have a uniform fall throughout. Mr. Grantham states further that the method of treatment on the sands would be such as to remove all ground of opposition on the part of those who are interested in the oyster fisheries of these coasts. But there is one strong argument on this subject which Mr. Grantham does not seem to have advanced. The scheme, we would observe, has already been approved by Parliament and authorized by an Act. The project failed for the time, owing to the want of the requisite capital. The works were commenced, but were stopped at an early stage through lack of funds. If Parliament will again approve, the County Council may carry out the scheme at the public cost. Whether the County Council will adopt the project, remains to be seen. The next step in regard to the disposal of the sewage will consist in the presentation to the Council of a report from Sir Benjamin Baker, in association with their Engineer, Mr. A. R. Binnie. What these professional authorities may recommend is as yet unknown. Some decision cannot be far off, unless the County Council think it prudent to delay the matter beyond the date of their next election.

Mr. T. Tyrer, who was one of the founders of the Society of Chemical Industry, and has filled the position of Secretary of the London Section for nearly ten years, will, we understand, shortly have his services recognized by a testimonial, funds for which are being raised by a Committee of which Mr. Daniel Howard, of the City Mills, Stratford, E., is Treasurer.

The Welsbach Incandescent Gas-Light.—In the paragraph on this subject in the JOURNAL last week, it was stated that 200 Welsbach lights were to be fitted up at the Army and Navy Stores. We now learn that the Incandescent Gas-Light Company have received an order for an additional 1000 lamps. When this is completed, there will be upwards of 1200 lights on the Welsbach system in operation on the premises in question.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 567.)

WITH the quiet season in full swing, doings on the Stock Exchange present, as might be expected, but few features of interest. Nothing has happened to cause any extraordinary fluctuation; and though some markets have been scarcely so firm, yet on the whole there is very little change to note. The Gas Market, however, has certainly been more active; a fair amount of business having been effected, especially in the heavier issues. The general tendency is decidedly firm; and the very few alterations which quotations have undergone are uniformly in the upward direction. Gaslight "A" has had its full share of business, and has commanded day after day the same steady figures—never falling below 238, while as the higher limit 240 has been marked more than once. The closing price was the best of the week; but the quotation is left undisturbed. With the exception of a single transaction in the 10 per cent. preference, the secured issues were quite neglected. The favourable aspect of South Metropolitan "B" which was apparent at the close of the preceding week, was confirmed by an advance of 1 in the quotation. Only one transaction in it, however, was the record of the week; and the other issues of the same Company were not dealt in at all. Commercials, too, were saved from complete stagnation by an operation in the debenture stock. The Suburban and Provincial undertakings continue very quiescent. With the exception of a couple of transactions in Brentford old, at about middle figures, nothing was done in any of them. Among the Foreign Companies, Bombay and Oriental have been most active. Imperial Continental has relapsed into quietude; but there is no sign of any falling off in the value. Continental Unions are well regarded; and the quotations have advanced. In Europeans, it will be observed that (in pursuance of the step recently resolved upon in relation to the capital account) the first issue of the new shares are now quoted fully paid, and the other issue as £7 10s. paid. Water has shown more activity, and the general tendency is firm, while some quotations have moved upwards.

The daily operations were: Only moderate business in Gas on Monday; but the prices realized were good throughout. Continental Union advanced 1. On Tuesday, operations were chiefly in Gaslight "A" and Imperial Continental, which were firm and unchanged. Continental Union preference improved 1. Among the very few transactions marked in Water was one in Kent at top price. Wednesday was quieter generally; though Gaslight "A" continued active. All quotations remained unchanged. In Water, Chelsea changed hands at over the top nominal price. Gas issues in general preserved much the same position on Thursday; and the only alteration was an advance of 1 in South Metropolitan "B." In Water, the quotation of Chelsea was put up 1. Friday's Gas business was a repetition of the preceding day; everything being firm and unchanged. In Water, Lambeth 10 per cent. rose 1. Saturday was very quiet; and all quotations closed without any further change.

ELECTRIC LIGHTING MEMORANDA.

A Disingenuous Argument—Fire Office Rules for Electricians—The Leamington Electric Lighting Good for Something.

IT was only to be expected that the electrical press would take notice of the extraordinary character of the accounts of the two largest London Gas Companies for the past half year; and therefore we were not surprised when the *Electrical Review* came out recently with an article on "The Relative Position of Gas and Electric Lighting," which professed to tell all about it. The article is not long, and may be best described as an attempt to "improve the occasion." It recites how that during the past two or three years the partisans of gas-lighting have been accustomed to cheer each other up by remarking that electricity could not hurt them. Now, however, it is said that the condition of affairs has materially altered. New central electric light stations have been inaugurated everywhere; and although our electrical contemporary cannot conscientiously argue that these are doing very good business, yet it flatters itself that they are beginning to tell upon the circumstances of the Gas Companies. To show the extent of the change, it is gravely remarked that "in the Metropolis alone the two largest Companies have sold considerably less gas during the half year ended June 30 than in the corresponding half of last year." This way of putting the facts is, to say the least of it, hardly fair. It does happen that the output of The Gaslight and Coke Company for the period named showed a slight falling off, the reason for which was carefully given by the Governor at the recent meeting. This is the only instance of the kind in the United Kingdom, however; and to make it appear the rule rather than the solitary exception, the electricians have had to drag in the South Metropolitan case, omitting all mention of the strike and the fact that since the full supply has been resumed the Company have been able to record an exceedingly satisfactory increase in their consumption. Then they talk of these indications of a falling off in the demand for gas as being taken "from the Metropolis alone," as though others could have been

had in plenty if required. We challenge the *Electrical Review* to parallel them, with or without strike conditions. The flimsy foundation for the article being thus exhibited, it is not worth while to deal with the word-spinning of the article itself, and its laboured attempt to argue that people should leave off putting money into gas and try electric lights instead. It will be time enough to take such writing seriously when the electricians can explain how it is that the gas industry of the United States has never been so prosperous as it has since the introduction of electric lighting into the country.

Electricians are still making a hubbub over the fire rules for the electric wiring of houses. The idea of having one set of rules to which electrical contractors may be able to work is at the first sight a very attractive one; but we rather incline to the opinion that electricians will have to share the fate of gas-fitters in a similar event, and meet every fresh case on its own merits. It can hardly be an impossible thing to settle the principal desiderata of safe electric light wiring; but exceptional cases are certain to arise from time to time, which cannot be dealt with by hard-and-fast rules. In these, the decision of a competent authority must be had. The project of employing the Institution of Electrical Engineers, or the Board of Trade, or any other outside body to draw up a code of fire rules, falls to the ground the moment it is perceived that since the Fire Offices would have to pay the damage, they must have the last word as to what precautions they would be satisfied with before issuing a policy. It would be absurd for, say, the Board of Trade to decide that immunity from risk of fire could be secured in a certain way; and then for the Fire Offices to refuse to take the risk. That the matter is a serious one, both for electricians and the Fire Offices, is shown by the statement that in the town of Boston (Mass.) alone the fire losses due to electricity are valued for the past year at nearly £200,000. It is all very well for electricians at Sanitary Congresses and elsewhere to talk of the harmlessness of electric lighting; but seeing that wherever electric lighting is used there are as a matter of fact additional fire losses, the truth of the question cannot be put aside by airily optimistic expressions.

There is a line in a recent issue of the *Electrical Review* which is very startling if hastily scanned. It reads: "The electric light at Leamington has proved a distinct success." The astounded reader has only to look again, however, to find that this statement concludes a sentence which begins with the words, "As a means of supplying a never-failing subject for argument and discussion." This sets the matter straight; but the sentence is worth quoting to show how essential it is to know the context before deciding upon the truth or otherwise of any random quotation. We believe that not even an electric light journal could describe the Leamington experiment as successful in any other sense than that of constituting a never-failing topic of discussion for the local public. This in itself is not a bad thing, so far as it goes. Many men and causes have gained success of another kind in the end, as the result of first getting themselves constantly talked about and plentifully abused. It is to be feared, however, that the discussions about the Leamington lighting will not have any such satisfactory consequence for the proprietors of the electric lighting plant. Moreover, it has to be shown that Leamington is such a dead-and-alive place that something to talk about is likely to be locally regarded as cheap at the cost of the electric lighting. The latest form of the discussion is reported to be as to whether or not the illuminating power of the lamps is up to the standard. It is not a great matter; but it may be observed that this is a complaint that sooner or later breaks out wherever electric lighting is tried. Gas managers, who once had a monopoly of this order of grievance, may well smile when they hear the much-bandied expression "illuminating power" invoked against those who sometimes appear to think that public lighting is a business of all profit and no trouble.

Mr. Herbert Andrew.—The Gas and Water Committees of the Oldham Corporation have joined in the recommendation to the Town Council to increase the salary of Mr. Herbert Andrew, Superintendent of those departments, by £100 per annum. The Committee recommend this increase "after carefully considering the statistics furnished by the Superintendent of the growth and development of the two departments over which he has control, and the increased duties and responsibilities devolving upon him."

The Testimonial to Mr. George Livesey.—According to the *Charity Record*, something like two dozen appeals (many of them accompanied by books, pamphlets, reports, &c.) have been forwarded to Mr. George Livesey by enterprising secretaries of societies who are anxious to secure some part of the £1750—the money portion of the testimonial recently presented to him—which is now awaiting his diposal. Mr. Livesey is at present away on his holiday; and although he will, of course, on his return to London, give to the various documents submitted to him all the attention they merit, there is little doubt that those institutions which afford the best hospital and convalescent assistance to the men employed on the Company's works will have the first consideration.

A NEW RESIDUAL.

The existence of cyanogen compounds in crude coal gas has been known for some years. In the Claus process, which was tried at Birmingham in 1886, and is in use in Belfast and other places at the present time, the recovery and profitable utilization of these substances is a special feature. Their existence, however, was regarded as an incidental matter. They were merely turned to account because they happened to be present. But on the Continent, especially in Germany, matters appear to have advanced a step farther. Not only is it sought to utilize the cyanogen matters, but chemists have pointed out that nitrogen, existing in the form of cyanogen, has a much greater commercial value than that obtained as ammonia. Attention is therefore being directed to the operations of distillation, and especially of purification, with a view of obtaining the largest possible proportion of the more valuable cyanogen compounds from the residuals.

In connection with the Claus process, Mr. Charles Hunt mentioned, in his paper read before The Gas Institute in 1886, that the spent liquor is found to contain sulphocyanide and ferrocyanide of sodium. The sulphocyanide is said to be derived partly from the bisulphide of carbon, but mainly by the reaction between cyanide and bisulphide of ammonium, thus:

$$NH_4Cy + (NH_4)_2S_2 = NH_4CyS + (NH_4)_2S$$

The ferrocyanide is derived from the cyanide of ammonium by the action of the sulphide of iron from the iron of the apparatus. The ferrocyanide is decomposed first by the addition of a salt of iron, leading to the formation of Prussian blue (ferrocyanide of iron), which settles as a precipitate. The clear liquid is drawn off, passed through the sulphur wash-tower in order that it may be charged with sulphurous acid, and a solution of sulphate of copper is added, which causes a precipitate of cuprous sulphocyanide. The clear liquid is run off as waste. One ton of coal was said to yield about ¼ lb. of Prussian blue, and 1¾ lbs. of copper sulphocyanide. So far the progress of the cyanogen from its original combination with ammonium in the gas to the commercial products is rendered clear. It appears that the proportion by percentage is very small, as the finished products only represent 2¾ lbs., or 0·1 per cent. of the weight of the coal. The additional profit due to the utilization of the cyanogen naturally claimed some attention in the discussion which followed the paper, and Professor Heaton pointed out that any cyanogen compound—such, for instance, as cyanide of potassium—could be readily obtained from the cuprous compound, while Prussian blue was in good demand. Mr. C. W. Folkard, after some experience in extracting cyanides from spent oxide, thought that it would be difficult to find a good market for any quantity of them.

Mr. C. W. Watts, in a paper read before the Society of Chemical Industry about six months later,* referred to the existence in crude gas of cyanogen in the form of hydrocyanic acid. This is said to range from *nil* to 0·1 per cent. by volume, and to be removed in the scrubbers with the other impurities. Mention is made of the presence of sodium thiocyanate in the scrubber liquor; the sodium being derived from caustic soda added to expel the fixed ammonia. In accounting for the action in the scrubbers, however, the hydrocyanic acid is assumed to be in combination as cyanide of ammonium; and the above equation is quoted to show the formation of thiocyanate—the same thing as sulphocyanide—of ammonium. Another source of sulphocyanide is referred to, and that is the spontaneous decomposition of ammonium thiocarbonate, thus:

$$(NH_4)_2CS_3 = NH_4CyS + 2H_2S$$

The total yield of sodium thiocyanate is put at 2·3 lbs. per ton of coal; and this salt can be recovered by evaporation, or precipitated with copper as above described. In an article by Messrs. Watts and Heaton, which appeared in the volume of the JOURNAL already quoted (p. 577), it is stated that the bulk of the cyanogen is found in the spent liquor as sulphocyanide of ammonium. The ammonia can be driven off by steaming with lime, carbonate of soda, or carbonate of potash. The liquid is mixed with a proper proportion of alkali, and naked steam is driven through it. The ammonia passes off to the saturator, and the residual liquor yields on evaporation the sulphocyanide of the alkali. If carbonate of potassium has been used, the resulting sulphocyanide can be converted into ferrocyanide (yellow prussiate of potash) by ignition with metallic iron. The yield of sulphocyanide of potassium is found at Birmingham to be 2·58 lbs. per ton of coal used; and this would give 1·1 lbs. of ferrocyanide, the net profit on which, after paying expenses, would be something over 2d.

At the 1888 meeting of the Société Technique du Gaz en France, M. Pendrié read a paper, embodying the results of practical research on this subject, which was subsequently noticed in the JOURNAL (Vol. LIII., p. 1040). He concluded that, during the distillation, part of the ammonia originally formed was converted into cyanogen before it left the retort, and appeared in the products of distillation as hydrocyanic and sulphocyanic acids. Of these, the greater part was retained by the ammoniacal liquor, and the remainder passed on to the purifiers. According to his calculations, a ton of coal would yield about ¾ lb. of cyanogen, of which more than one-third

* See JOURNAL, Vol. L., p. 197.

would escape absorption in the scrubbers and washers. He stated that nitrogen in the form of cyanide is more valuable than when it is converted into ammonia; and he accounted for the formation of cyanogen in the retort by the following reaction:

$$2C + 4NH_3 = 2(NH_4)Cy + 2H_2$$

The ammonia coming in contact with red-hot carbon combines with it; at the same time giving up one-third of its hydrogen, which goes to increase the bulk of gas.

In a contribution to a German scientific magazine by Herr J. V. Esop, to which attention was directed in our columns early in the present year, it is stated that cyanogen is present in spent oxide as sulphocyanates, which are soluble in water and alkalies, and also as ferrocyanogen, which exists in the form of a double compound of Prussian blue and ammonium ferrocyanide, insoluble in water, but soluble in alkalies. The whole of the former class might be removed by sufficient washing; and it appears probable that a very large proportion, if not all of them, were taken out by the Claus process at Birmingham. At the same time it is possible that they may escape the less searching action of washers and scrubbers, as applied in the ordinary way. The author obtained various quantities, ranging from 1 to 4 per cent., of sulphocyanic acid, and from 3½ to 9 per cent. of potassium ferrocyanide, from different samples of oxide. He points out that if the oxides are allowed to heat, the sulphocyanic acid is likely to be decomposed; only a portion going to form ferrocyanide, and the remainder being changed into ammonium salts. In addition to this loss, the oxide that has heated is more difficult to treat; and consequently the the cyanogen cannot be so readily extracted. Various plans were tried for separating the cyanogen, chiefly depending on the action first of water to dissolve the sulphocyanides, and then of alkalies to take up the ferrocyanides. But these were not entirely satisfactory; and a convenient and cheap method was discovered in which the spent oxide was treated with lime and sulphate of soda. One result of working this process was the discovery that a sulphocyanogen compound insoluble in water exists in the spent oxide, sometimes to the extent of upwards of 2 per cent.

The latest contribution to this subject is a paper by Herr Leybold, of Frankfort-on-the-Main, which was read at the last meeting of the Bavarian Gas Association. This gentleman states that if an indifferent gas, such as hydrogen, is charged with vapour of ammonia by being led through an ammoniacal solution, and then passed over glowing coke, a considerable portion of the ammonia is decomposed into its elements, and at the same time formation of hydrocyanic acid takes place. With very hot coke and a slow stream of gas, more than half of the ammonia may be converted into hydrocyanic acid. So it is evident that the circumstances in the ordinary gas-retort are favourable to the production of cyanogen, but too high a temperature decomposes it; and perhaps this is the reason why the proportion of cyanogen obtained in England is only a small fraction of the ammonia. Herr Leybold refers to an instance in which the proportion of ammonia to cyanogen was only 3 : 1; and it would be interesting to know the circumstances under which this was obtained, as the evidence above quoted shows it to be more like 8 : 1 or 10 : 1. At the outlet of the foul main, it appears the whole of the cyanogen has combined with ammonia. Some of it is deposited in the condensed liquor as sulphocyanide of ammonium. Very little is washed out in the scrubber, because carbonic acid has the effect of driving it forward. So the bulk goes on to the purifiers; and it is stated that oxide of iron has the property of absorbing it in the presence of carbonic acid. About 8 per cent. of the cyanogen is deposited in the condensers; rather less in the scrubbers; 50 to 70 per cent. in the purifiers; and the remainder passes on to the holders. The larger the number of purifiers, the greater the proportion of cyanogen absorbed; and it is stated that a purifier will be efficacious in this respect after it is saturated with sulphuretted hydrogen. By passing the gas at a moderately rapid, but not excessive, speed through at least three boxes, one of which is allowed to remain in use for a long time, specially for cyanogen, the proportion of Prussian blue in the spent material can be raised as high as 10 per cent. It is said that the sulphide of iron is the active agent, and that hydrocyanic acid is not acted upon by clean oxide. If any is taken up by the moisture, it rapidly evaporates on exposure to air. Cyanide of iron is formed in the purifier, and becomes converted into Prussian blue on exposure to the atmosphere. This explains the fact that spent lime, though quite white on leaving the purifier, is apt to turn blue after free contact with the air. The product is not quite pure; and if ammonia is also present in the gas, a large proportion of sulphocyanide may be formed at the expense of the Prussian blue. This action also takes place if the ammonia is combined with an acid, though not to so great an extent as when it is free. Other alkalies have a similar effect, and also produce cyanides. An instance is given in which the improvement of the scrubbing plant, resulting in the recovery of one-third more ammonia, altered the proportions of Prussian blue and sulphocyanide from 3 and 5·96 per cent. respectively, to 5·64 and 2·92 per cent. From this it appears that the modern methods of working are favourable to the recovery of cyanogen as Prussian blue in the oxide purifiers.

Cyanogen may also be recovered in the wet way by Herr Knublauch's patent process, which consists of scrubbing or washing the gas, just before the purifiers, with a mixture of caustic soda and green vitriol in solution. The iron precipitate is gradually dissolved, with the formation of ferrocyanide of soda. It is stated that the whole of the cyanogen can be recovered in this way, and that the saturated solution only requires to be concentrated by evaporation, when the cyanogen is obtained in a more valuable form than in the spent oxide. Assuming that a market could be found for the ferrocyanide solution, the simplicity of this process commends it to the attention of gas engineers. This process may also be used as a laboratory test for cyanogen. The crude gas is caused to pass through three Woulfe's bottles, charged with the solution. After passing a measured quantity, the solution is collected in a flask, boiled for 15 minutes, filtered, and the cyanogen precipitated as Prussian blue by the addition of a salt of iron. The precipitate is decomposed by caustic soda, and the clear solution is rendered acid with sulphuric acid, reduced by zinc, and titrated with permanganate in the usual way.

So far, it appears that there is a choice of methods by which the cyanogen present in coal gas can be recovered, either as Prussian blue or as solution of ferrocyanide of sodium or of potassium; and that these methods are not more complicated than those incidental to ordinary scrubbers, purifiers, and sulphate plant. But now we want to know whether buyers of spent oxide are inclined to take the proportion of Prussian blue that may be present as an item to be calculated in the price; and, if so, the market value per unit. We likewise wish to know if a market exists for alkaline ferrocyanides, and the price they will fetch; and also if the demand for cyanogen compounds is sufficiently extensive to take the whole of the production at gas-works. Old shoes are said to be the chief source of these compounds at present; but the process of treatment is complicated and costly. Once assured of remunerative prices, there are plenty of gas engineers who would very shortly put a supply of cyanides on the market.

The Wenham Company, Limited, of Upper Ogle Street, Fitzroy Square, have recently carried out several important installations of the electric light; amongst others at the Dental Hospital, Leicester Square, and in the new theatre and winter gardens at Craig-y-nôs Castle, for Madame Patti-Nicolini. The theatre contains in all about 220 lamps, including wiring, batten, footlights, and coloured lamps; and there are a number of suspended lamps in the winter gardens.

Potts's Mining Register and Directory.—We have received a copy of "Potts's Mining Register and Directory for the Coal and Ironstone Trades of Great Britain and Ireland for 1890." This is the third annual issue of a useful work, to which we have before called attention; and although the present volume does not contain any new features calling for special notice, its contents bear marks of careful revision, so as to bring them down to date. The book furnishes valuable statistical information on the coal and iron industries; supplemented by maps of the various coal-fields. The publisher (Mr. W. J. Potts, of North Shields) is unwilling to rest contented with the reputation his book has gained, but purposes enhancing its value by the addition next year of a "Directory of Mining Engineers," and at the same time he offers a prize of £10 10s. for an approved original article on the geology of the coal-field or coal-fields in any county or group of adjacent counties in the United Kingdom. The book is well printed, and strongly bound.

Local Authorities and Gas Undertakings in South Australia.—In the first number of the JOURNAL for the present year, we mentioned that the Legislative Council of South Australia had had under consideration a Bill to enable Corporations and District Councils to supply gas and electricity for lighting purposes. As this Bill, if passed, would have authorized the employment of the public funds in competing with private gas undertakings, the measure was promptly petitioned against by the South Australian Gas Company. The whole matter was referred to a Select Committee, who, as stated in the JOURNAL for Feb. 8 last (p. 241), after examining several witnesses, reported in favour of the investigation being continued by a Royal Commission. On the 30th of April last the Commission was appointed—the Chairman of the original Committee (the Hon. R. C. Baker) being selected to preside. The inquiry was opened on May 15, and continued, at intervals, to July 1. The witnesses examined were the Secretary of the South Australian Gas Company (Mr. J. Evans), the Town Clerk of Adelaide (Mr. T. Worsnop), and three Mayors of neighbouring towns. The report was presented in due course; and, stated generally, the conclusion arrived at by the Commissioners was that the Bill should be so altered as to make it conform to English precedent in the case of local authorities wishing to become suppliers of gas—viz., that due provision should be made for the acquisition of the undertaking of the gas company in possession of the district. As far as electricity was concerned, the powers proposed to be granted were to stand. When this Bill becomes law, the local authorities interested in the matter will be able to open negotiations with the Directors of the South Australian Gas Company for the purchase of their works at a figure to be fixed by valuation. The Company are to be congratulated on the ability with which their petition was supported by Mr. Evans before both the Select Committee and the subsequent Commission.

COMMUNICATED ARTICLES.

THE VALUATION OF GAS-WORKS FOR ASSESSMENT.

By Thomas Newbigging, M. Inst. C.E.

III.

It has been said further, and said with much heat, by administrators of gas undertakings who have felt the pressure of the rates, that the present mode of assessing gas-works is, in numerous instances, simply the levying of a tax on good working. From the point of view of some of the companies under the sliding scale, many of whom are paying abnormally high dividends, and whose management may be supposed to be of the best owing to the stimulus afforded by the prospect of large profits, there is some force in the argument. But all taxes are in a sense taxes on good working. If there were no profits there would be no rents, and no rates, and indeed "no nothing;" and the greater these are, the higher the rents eventually and the more the rates. Good results, however, are not invariably or exclusively the fruit of good management. There are many gas-works so situated in favourable districts that it is hardly possible their results—so far as revenue is concerned—should be otherwise than good, even although the management may be only indifferent; and such companies may well be willing to pay rates and taxes commensurate with their special advantages. Better be called on to pay the rates than forego the profits.

Success is not always simply the result of good administration; very frequently it is only the index of the value of a district for gas supply. It would be easy, though it might be invidious, to point to examples of this fact—examples of places where, though the management, or, to speak correctly, the administration, is by no means admirable, the profits are large. The field for the consumption of gas is so advantageous in such places, that a second or third rate husbandry—as in some tropical countries, where the only cultivation needed by the soil is tickling with a hoe—produces a luxuriant crop of profit. The circumstances of other works are such that the best management would fail to make them greatly prosperous; and their taxation is, or should be, low accordingly. Again, there are undertakings which are not eminently successful that ought to be so. The members of the committee, or most of them, strive to make them yield a good return for the capital invested, and the manager does the same. The latter, however—on whom the success of the concern mainly depends—is hampered in his operations by meddling and peddling individuals (by no means uncommon amongst local authorities), who worm their way into power, and, elbowing the gas manager aside, pose as the moving spirits of the department, and are a stumbling block to its progress. In this case the results cannot possibly be as satisfactory as they otherwise might. No doubt also there may be found works controlled by a manager of mediocre talent, and with but few resources; yet he struggles on to the best of his ability. Neither directors nor manager think themselves deficient in the power to ensure success; and so the results are comparatively meagre. It would scarcely be fair to assess such concerns at an equal rate with those better administered, as that would be tantamount to a punishment for lack of judgment and ability—qualities that cannot always be insured in individuals, and the want of which certainly does not come within the purview of the penal clauses of any Act of Parliament.

Assuming that success is chiefly dependent on good management, as is undoubtedly the fact, and that this has been forthcoming, there is no reason, as it appears to us, why a concern fortunately circumstanced both as to its position and in its servants, should not bear an assessment proportioned to its proved power to earn large profits, and by inference to command a higher rent than one less favoured. If circumstances necessitated the letting of such a well-placed and well-managed gas undertaking, the proprietors would assuredly base their calculation of the rent on the annual profits which the concern had been proved capable of yielding.

But it is needless to labour the refutation of the tax-on-good-working argument. It is used generally by disappointed appellants as, or immediately after, they leave the assessment committee room, having had the worst of the encounter with the official valuer. On further consideration, they may have found reason to alter their views. Theirs may or may not be an example of good working; the complaint is made all the same. There are different ways of working well; and good working in the direction of keeping down the capital to a reasonable figure results in lowering the assessment. We know for a fact that companies whose working is not of the best, have in some instances to pay on a higher assessment than that of other well-managed ones. It occurs in this way: In an ill-managed concern, instead of the dividend coming down, as it ought to do, the price of the gas usually goes up; so the assessment is maintained at a high figure, the consumer really paying the excess rates.

It has been suggested that the rating of gas-works throughout the country might be at a fixed amount per 1000 cubic feet of gas sold, or per ton of coal carbonized, for every 1s. in the £ of rate levied in a district. But a moment's consideration will show that the incidence of the rate levied in this way would not be equal. We have recently had before us the case of a company in the Midlands whose rates amount to 10s. 6d. in the £. In this instance the rates to be paid, if levied in the manner proposed, would be twice or even three times more than in other places. It may be said that at least they would not be in excess of those paid by the inhabitants of the town in question. But that is not so; for, as a matter of fact, the rental value of houses and other property is 30 to 50 per cent. lower than in other similar towns, owing solely to the pressure of the rates. Thus the gas company, rated as suggested, would be grossly over-taxed, even in comparison with the resident inhabitants.

In basing the rent, and therefore the assessment, on the profits, the difficulty which would otherwise exist in dealing with a works which has been constructed of greater magnitude in a district than is immediately required, and of particular manufacturing stations being set down during the summer months, does not arise. The structural value of the works affects the amount of the statutable deductions, however, and also the apportionment between the several parishes; and if the works are on a much larger scale *than is actually necessary for the maximum daily make*, allowance should be made for the excess. This, it will be evident, instead of reducing the amount of the assessment will increase it, because the statutable deduction for renewals will be less in the proportion of the allowance which has been made.

For the reasons given, therefore, we are inclined to fall back on the rent basis defined by the Parochial Assessment Act, as being after all the most satisfactory method hitherto suggested for calculating the assessment. At the same time, it must be admitted that the hypothetical tenant is not without his faults. He is far from being impeccable; but he often has to incur more censure than he fairly deserves. There are hypothetical valuers as well as hypothetical tenants; and *they* sometimes work mischief and cause trouble.

The system of assessment for rating purposes has not by any means been reduced to an exact science. There is ample scope for the ingenious legislator to try his hand at improvement. Even when both of the parties interested understand, or think they understand, the matter in all its bearings, and are anxious to do what is just and right, there is always room for considerable divergence of opinion and practice. Hence the disputes that arise, and the need of reference to constituted and unbiassed authority. The necessity for occasional appeal to an impartial tribunal will not be done away with, however much we may succeed in remedying existing defects.

I have dealt thus lengthily, and I trust usefully, with some of the chief objections to, and the suggested alterations in, the mode of assessing gas property, in order to clear the way for the discussion of the details that follow.

(To be continued.)

STREET WATERING WITH SEA WATER.

By A Seaside Water Inspector.

Considerable attention has been given to the subject of watering roads; and it has been asserted very strongly that sea water should be used in all seaside towns—first, because it is more economical; and secondly, because of its capability of binding the surface of the roads. A great deal is made of the fallacious assertion that seaside towns have a limited supply of water during the season, when the population is mostly doubled; but in the papers read before scientific societies, and the notices which appear in the technical journals, there is no attempt made to tabulate the towns which run short of water during the summer months. The number of towns using and advocating the use of salt water is about 26, three of which are only known to have an inadequate service of pure water, and are ill-advised in laying out large sums of money to pump sea water, when the same outlay would have procured an abundant supply of pure water for the inhabitants for many years to come.

An argument is sometimes adduced, representing the water company as being antagonistic to the local authority, inasmuch as the latter is desirous of introducing another water company to sell salt water instead of fresh, for the purposes for which the original company had been granted parliamentary powers. This is parallel to the water-gas crusade—seeking powers to lay down plant and distribute this poisonous stuff at a cheaper rate than the original gas company. If a local authority desires to have dirty water distributed throughout the town, the water company having all the plant at hand, could readily sink shallow wells and pump surface water, or sea water, cheaper than the authorities could erect new pumping plant and lay distributing-mains for the purpose. Of course, the whole of the evidence is obtained from corporation officials, who were loud in their promises—before the water undertaking was purchased—to sell water by meter; but in no instance has this supposed boon been granted to the public.

The figures quoted by the officials, compared with those obtained by the officials of water companies, are entirely different; as are also the statements made as to the use of sea water, which is said to be conducive to health, but in what manner is not fully explained. The Registrar-General's report does not show this result. Besides the large amount of salts contained in sea-water, there is a considerable quantity of glutinous sap derived from decaying seaweed washed up by the storms. This glutinous mess, left on the surface of roads has a tendency to bind the macadam; but most of the advocates of sea water state that for every two loads of salt water there should be one of fresh water—perhaps to wash away these impurities,

or rather to lessen them. In one instance the streets are watered twice during the day—once with fresh, and once with salt water, as the rising ground would become too slippery if sprinkled twice with salt water. The general rule is not to use salt water on roads where the gradient is (say) 1 in 20, as they become greasy, and horses cannot stand on them. Such roads are sadly deteriorated, and become as rotten as possible in winter. Swamping wood pavements with salt water makes them exceedingly slippery. If used for flushing sewers, a very large volume of water must be employed, as small quantities of sea water mixing with the sewage have a tendency to produce noxious gases, and serious complaints are soon heard. The street watering is confined to just three months in the year; and the lowest estimate of the cost of pumping is 4d. per 1000 gallons, while the very high parts of the town are usually watered from the street hydrants as before.

More than half the towns which once employed sea water have discontinued its use. Now, if it is of such great worth to the community some would make out, is it likely that upwards of 50 per cent. would be found giving it up because they could not extend their works for such a purpose? All towns are subject to some little neglect in the height of the season, owing to the staff of workmen being overtaxed; and in the extremely hot weather it is not desirable to pour salt water on roads not thoroughly well scavengered. All engineers who may have selected and visited the most popular seaside resorts during the hottest months of the year, for the express purpose of deciding which water is preferable to sprinkle over the roads, will not hesitate to give the preference to the present method, not only in regard to the health of the visitors, and the general sanitary condition of the town, but also to the comfort of the inhabitants. As to the evaporation of salt water from the street surface injuring cutlery, jewellery, and fine metal goods, &c., exposed in shop windows, as well as locks, fittings, and fine art treasures in houses, there cannot be two opinions; and the effect is much greater when all the streets are swamped with a saline mixture. The engineer of the principal town in which sea water is used, acknowledges that it disintegrates granite macadam roads.

The advocates of the salt-water system base all their figures on the cost of 1s. per 1000 gallons. This is a most inaccurate estimate, as the average of all the most important seaside towns amounts to just 9½d. per 1000 gallons. On private enquiry I find that the majority of companies have a special low charge for street watering and flushing. If town officials, in their wisdom, should elect to put the ratepayers to the expense of another water supply, surely they ought first to count the cost, when it would certainly be found that the present system is most economical. If the town is suffering from an insufficient supply, it would still be preferable to expend money in extending the works, and to sell a supply of water for the same amount as the ratepayers would be saddled with if a second plant were to be purchased. The highest lift in the towns referred to is 50 feet. Now, in many cases, and in most of the new and progressive seaside resorts which are at present paying but 6d. to 8d. per 1000 gallons, from 300 to 400 feet must be attained to water the hill-side streets. Nothing is said about the deterioration of plant—mains, cocks, hydrants, water-vans, stand pipes, tower, &c. Neither is anything said of the kind of meter used to measure the quantity supplied to baths. I used the ordinary inferential meter once for filling carts with salt water; and it did not last a month.

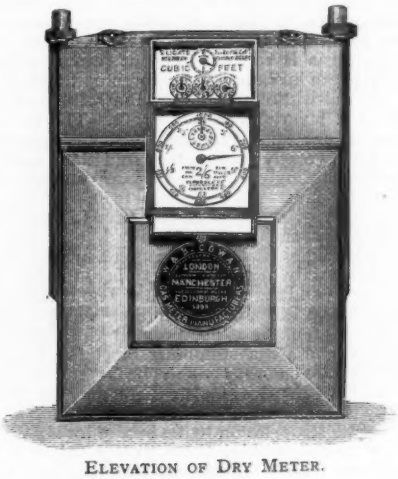
I have visited the towns where sea water is in use, and have made strict inquiry from people constantly driving over the roads, and they are loud in condemnation of this water for sprinkling; stating that the roads are slippery, and that where there is much traffic the surface is not bound, but is a loose mess, and when winter sets in the salt in the roads rots them, and makes a considerable amount of mud, causing much cleaning and repairs. Besides this there is the deleterious effect of the "glutinous sap" on the flowers and vegetation, which is strikingly apparent in the older seaside towns which have resorted to the use of sea water. Their appearance forms a remarkable contrast to the modern town—with its parades adorned with flower-beds and shrubs, its tree-lined streets, and its turf-bordered footpaths—in which fresh-water is always used for the sprinkling of the roads.

"Arithmetical Physics."—Under this title, Mr. C. J. Woodward, B.Sc., Principal of the Chemistry and Physics Department of the Birmingham and Midland Institute, is bringing out a series of educational works of great utility to the science student. One of the latest additions deals with the questions of sound, light, and heat in a thoroughly systematic way, calculated to be very helpful to candidates for degrees and honours in these subjects. The author is clear and concise in giving his instruction; while, following the modern practice, he closes his chapters with numerous exercises to test his reader's power, but at the same time supplies him with the answers. There is an appendix containing the recent examination papers in the three subjects treated, with the questions classified, followed by tables and contents; and there are eight clearly-printed plates at the end. The book is published by Messrs. Cornish Bros., of Birmingham, and Messrs. Simpkin, Marshall, and Co., of London,

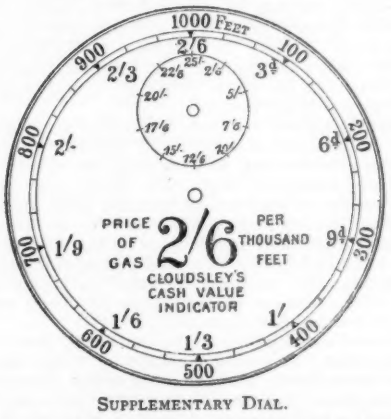
TECHNICAL RECORD.

CLOUDSLEY'S CASH-VALUE INDICATOR FOR GAS-METER INDICES.

It is, we think, a generally admitted proposition among gas managers, that one of the greatest impediments in the way of the real progress of gas as an illuminating and heating agent is the wasteful manner in which it is used by consumers. In most cases, this is the result of thoughtlessness. Gas, like time, is liable to be frittered away; and it has been frequently urged that if a gas consumer would occasionally consult his meter index, he would have less cause for surprise at the amount of his gas bill at the end of the quarter, and greater opportunity of putting a stop to unnecessary consumption. When this is suggested to a consumer, he generally pleads inability to "read the index," though cards of various kinds, with moveable pointers and full directions for use, have been brought out from time to time. Only a few weeks ago we noticed the publication of a diary, in which facilities were afforded to a consumer for keeping a weekly record of the gas burnt in his establishment. The real want, however, has been some method of recording gas consumption—and perhaps not so much the quantity as the actual cost of the gas burnt—that is as intelligible to the ordinary consumer as are the indications of a clock. This want has now been supplied by Mr. J. L. Cloudsley, who, as the outcome of a conversation with Mr. C. Stafford Ellery, of Bath, has devised the arrangement shown in the accompanying illustrations, by which the quantity and the corresponding value of the gas burnt are recorded on a separate dial.



ELEVATION OF DRY METER.



SUPPLEMENTARY DIAL.

There are, as will be seen, on the indicator dial, two circles, the smaller of which records ten times the value of the larger one. For small consumers, the larger circle, which is 3½ inches in diameter, records 1000 cubic feet, divided into hundreds; the price being marked against each division. For larger consumers the indicator is proportionately increased. When the price of gas changes, the dial (which is of cardboard) is removed, and a new one, with altered price, substituted without difficulty. The mechanism is simple, consisting, as applied to a dry meter, of a train of three toothed wheels, which gears with one of the wheels of the index. No alteration of wheels is necessary with the change of price. The indicator is placed below the index, but may be attached above, or at the side. The glazed door covering the indicator can be secured, if necessary, by a padlock, or an adhesive label on which may be noted the date and amount of the last inspection. It is intended that the inspector, when taking the reading of the index, should set the indicator pointers at zero, so that the consumer may at any time observe the value and quantity of gas which has

been used since the previous visit. The arrangement can be fitted to any make or size of dry or wet meter.

The indicator will be of much service to gas companies who have small consumers with weekly or monthly accounts. The inspector might collect these from the reading of the indicator; and the consumer, knowing beforehand what was due, could have the money ready. The ordinary index always acts as a check to the indicator reading. As the simple method here described is likely to lead to more careful consumption, it should be a boon to the gas industry.

THE MEETING OF THE BRITISH ASSOCIATION.

Sir Frederick Abel on the Progress of Science.

The Annual Meeting of the British Association for the Advancement of Science was opened last Wednesday at Leeds, by Professor FLOWER, F.R.S., the retiring President.

The preliminary proceedings consisted of the meeting of the General Committee, at which the report of the Council for the past year was read by Sir Douglas Galton, one of the General Secretaries, and, in conjunction with various recommendations, adopted. Professor A. W. Williamson, the General Treasurer, presented the balance-sheet, which showed an excess of expenditure over receipts to the extent of £753 9s. The accounts having been passed, the sectional officers were elected. The Presidents of the sections in which our readers are chiefly interested were: Mathematical and Physical Science, Dr. J. W. L. Glaisher; Chemical Science, Professor T. E. Thorpe; Geology, Professor A. H. Green; Economic Science and Statistics, Professor A. Marshall; and Mechanical Science, Captain A. Noble. The Committee of Recommendations was next elected, and this portion of the business closed.

In the evening the first meeting was held in the Coliseum, when the presidency was relinquished by Professor Flower, and assumed by Sir FREDERICK ABEL, who proceeded to deliver his Inaugural Address, of which the chief matters of interest, as far as our readers are concerned, will be found in the following abstract.

The President commenced by alluding to the gaps which have been created in the ranks of those who were prominent workers in connection with the Association when the distinguished naturalist, Richard Owen, presided over the meeting held in Leeds 32 years ago. This led him to refer generally to the distinguished men who had been associated with the borough, specially mentioning Joseph Priestley, who was born within six miles of Leeds, and of whose life-work he gave a sketch. Proceeding next to deal with the development of applied science, he remarked that, in its various phases of practical application since 1858, perhaps the greatest strides had been made in connection with electricity. The special applications of this wonderful force to telegraphy were next discussed; and then the President passed on to consider its use for illuminating purposes. After glancing at the early history of electric lighting, Sir Frederick continued: Nine lighting companies either are now, or will very shortly be, actually at work, supplying, from central stations, districts of London comprising almost the entire western and north-western portions of the Metropolis. As regards other parts of England, there are already 27 lighting stations at work in different towns, besides others in course of establishment, and many more projected. Leeds has not failed to give serious attention to the subject of utilizing the electric light; and although no general scheme has yet been adopted, the electricians who now visit this town will rejoice to see many of its public buildings provided with efficient electric illumination. While the prediction made by Siemens, eight years ago, that electric lighting must take its place with us as a public illuminant, has thus been already in a measure fulfilled, important progress is being continuously made in developing and perfecting the arrangements for the generation of the supply, its efficient distribution from centres, and its delivery to the consumer in a form in which it can be safely and conveniently dealt with, and applied at an outlay which even now does not preclude a considerable section of the public from enjoying the decided advantages presented by electric lighting over illumination by coal gas. Yet our recent progress in this direction, encouraging though it has been, is insignificant as compared with the strides made in the application of electric lighting in the United States, as may be gauged by the fact that, while in America the number of arc lamps in use in April of this year was 235,000, and of glow lamps about 3,000,000, there are at present about 1-10th the number of the latter, and 1-100th the number of arc lamps, in operation in England. In some important directions we may, however, lay claim to rank foremost in the application of the electric light. Thus, our large passenger ships and our warships are provided with efficient electrical illumination; to the active operations of our Navy the electric light has become an indispensable adjunct; and our system of coast defence, by artillery and submarine mines, is equally dependent for its thorough efficiency upon the applications of electricity. Other important applications of the electric light, such as its use as a lighthouse illuminant, for the lighting of main roads in coal mines, and even for signalling purposes in mid-air, through the agency of captive balloons, are continually affording fresh demonstrations of the value of this particular branch of applied electric science.

The electric transmission of power was next dealt with. The President stated that transmitted energy was first applied in Germany to haulage work in mines by the firm of Siemens some years ago, and great progress has since been achieved both here and on the Continent, as well as in America. It was very interesting, he said, to note, on the present occasion, that the first successful practical application of electricity in this country to pumping and underground haulage work was made in 1887, in the neighbourhood of Leeds, at the St. John's Colliery at Normanton, where an extensive installation was furnishing very satisfactory results in point of economy and efficiency. The gigantic installations existing for the same purposes in Nevada and California afforded remarkable illustrations of the work to be accomplished in the future by electrically transmitted energy. Reference to the employment of electricity in welding operations, brought this portion of the address to a close.

The next subjects to engage attention were those of alluminum alloys and the production of steel; and after a brief reference to the progress made by sanitary science since the period of the Crimean War, Sir Frederick passed on to deal at considerable length with explosives and cannon powders, on which he is an acknowledged specialist. Arising out of this subject, and closely allied to it, was that of explosions in mines and mills, and the appliances for preventing them—viz., safety-lamps. He referred to the encouragement given to the application of the combined resources of ingenuity, mechanical skill, and knowledge of scientific principles through the elaborate, but thoroughly practical, comparative trials to which almost every variety of safety-lamp had, during the last few years, been submitted by competent and conscientious experiments, and said this had resulted in the provision of lamps to the hand of the miner which combine the essential qualities of safety under the most exceptionally severe conditions, with good illuminating power, simplicity of construction, lightness, and moderate cost. Very important progress had also been made towards the provision of thoroughly serviceable and safe portable electric lamps for use in mines. The recent legislation in connection with mines was certainly deficient in any sufficiently decisive measure for excluding from the workings certain forms of lamps which, while fairly safe in the old days of sluggish ventilation, were unsafe in the rapid air currents now frequently met with in mines. It was however, he maintained, satisfactory to know that the strong representations on this subject made by the late Mines Commission, combined with the force of example and with the conclusive demonstration of the superiority of other lamps, by exhaustive experiments, had led within the last two years to the very general abandonment of the unprotected Davy, Clanny, and Stephenson lamps in favour either of simple, safe modifications of these, or of other safe and efficient lamps; and that one possible element of danger to the miner had thus been eliminated, at any rate in many districts. In addition to the disasters resulting from explosions in mines, a fruitful cause of accident was the spontaneous ignition of coal cargoes—a subject which was carefully inquired into some years ago by a Royal Commission of which he (the President) was a member, in conjunction with Dr. Percy. The light thrown by that inquiry upon the causes of these disasters, and upon the conditions to be fulfilled for guarding against the accumulation of fire-damp gradually escaping from occlusion in coal and of heat developed by chemical changes occuring in coal cargoes, had unquestionably led to an important reduction of the risks to which coal-laden ships were exposed. Subsequent official inquiries and experimental investigations, in which he had taken part with the late Sir Warington Smyth and several eminent naval officers, consequent upon the loss of Her Majesty's ship *Doterel* through the accidental ignition of an explosive mixture of petroleum spirit vapour and air, had resulted in the adoption of efficient arrangements for ventilating all spaces occupied by, and contiguous to, the large supplies of fuel which these vessels had to carry. It was impossible for the President to touch the subject of explosions without making some allusion to the many distressing accidents, frequently fatal, which have attended the domestic use of petroleum and mineral oils of kindred character. These, he said, had been made the subject of exhaustive investigations, which had demonstrated that these disasters might readily be prevented by the employment of lamps of proper construction, and by the observance of very simple precautions by the users of them. In this connection he referred to the recent official inquiry which he had conducted with Mr. Boverton Redwood, and which had furnished proof that very substantial progress had recently been made by lamp manufacturers in the voluntary adoption of such principles of construction as had been shown to be essential for securing the safe use of mineral oils in lamps for lighting and heating purposes, the employment of which had, within a brief period, received enormous expansion in this and other countries.*

The mention of petroleum suggested another subject calling for attention from the President. He remarked that the recent rapid development of the petroleum trade furnished one of the most remarkable illustrations which could be cited of industrial progress during the period which had elapsed since the British Association last met in Leeds. One year after that meeting—viz., on Aug. 28, 1859—the first well drilled in the United

* This matter has recently been dealt with by Colonel Majendie, whose report was noticed in the JOURNAL for July 8 last (p. 84).—ED. J. G. L.

States with the object of obtaining petroleum was successfully completed; and the rate of increase in production in the Pennsylvania oil-fields during the succeeding years was shown by the following figures: In the year 1859, only 5000 barrels (of 42 American gallons) were produced; in the following year the production increased to 500,000 barrels; while in the next year (1861) it exceeded 2,000,000 barrels, at which figure it remained, with slight fluctuations, until 1865. The supply then continued to increase gradually, until, in 1882, it reached 31 million barrels. Since then the supply furnished by the United States has fallen somewhat; and last year it amounted to 21½ million barrels. The production of crude petroleum in the Pennsylvanian fields, large as it has been, has not however kept pace with the consumption; for the accumulated stocks, which on Dec. 31, 1888, amounted to upwards of 18,000,000 barrels, had become reduced to about 11,000,000 barrels at the close of last year. At this rate the surplus stock above ground would, Sir Frederick thought, have vanished by the end of the current year. In addition to the petroleum raised in Pennsylvania, there is now a very large production in the State of Ohio, which is, however, transported by pipe-line in great quantities to Chicago, for use as liquid fuel in industrial operations. Turning to the supply from the Baku district, on the borders of the Caspian Sea, it was stated that in 1863 the supply of petroleum amounted to 5018 tons; in 1873, it was about 64,000 tons. Three years later, 153,000 tons were produced; and in the following five years, there was a steady annual increase, until, in 1882, the production amounted to 677,269 tons. In 1884 it considerably exceeded 1,000,000 tons; and last year it was about 3,300,000 tons. The imported refined petroleum used in this country in lamps for lighting, heating, and cooking was exclusively American until within the last few years; but a very large proportion of the present supply comes from Russia. The imports of kerosene into London and the chief ports of the United Kingdom during 1889 amounted to 1,116,205 barrels of United States oil, and 771,227 barrels of Russian oil. During the same period, the outturn of mineral oil for use in lamps by the Scottish Shale Oil Companies probably amounted to about 500,000 barrels. The President remarked on this subject that the value of petroleum as a liquid fuel, and as a source of gas for illuminating purposes, had long since been recognized; and it was probable that one outcome of the attention which is now being given to the hitherto unworked deposits of petroleum in the East and West Indies, South America, and elsewhere would be a very large increase in its application to these uses. In the East Indies there were vast tracts of oil-fields in Burmah, Beloochistan, Assam, and the Punjab. The great extension of the petroleum trade was gradually leading to very important improvements in the system of transport of the material over water and on land.

The great development of the important liquid illuminant above alluded to having been discoursed upon, the President proceeded to refer to the utilization which has been witnessed within the past few years of the vast supplies of natural inflammable gas which are furnished by the oil-fields. He pointed out that in America this remarkable gas supply was for a long time only used locally; but before the close of 1885 its conveyance to a distance by pipes, for illuminating and heating purposes, had assumed large proportions—one of the companies in Pittsburgh having alone laid 335 miles of pipes of various sizes, through which gas was supplied equivalent in heating value to 3,650,000 tons of coal per annum. Since then the consumption in and around Pittsburgh has probably been at least trebled. The very rapid development of the employment of natural gas is not confined to the neighbourhood of Pittsburgh; it is used for heating purposes in a very large proportion of the cities, towns, and villages in Pennsylvania and North-Western New York. In North-Western Ohio many of the cities and towns are also supplied with natural gas; and a pipe-line has been recently laid to Detroit. It is estimated that in these localities no less than 36,131,669,000 cubic feet of the gas were consumed during last year; displacing 1,802,500 tons of coal. To the south-west of Pittsburgh there are many smaller places which consume natural gas. It also occurs in considerable quantity, and is being utilized, in Indiana (whence an account has recently reached us of a terrific subterranean explosion of the gas); and it is at the present time contemplated to carry a natural gas supply to Chicago. The utilization of the natural gas of the Russian oil-fields, although of very ancient date, has hitherto not been extensive; neither does the magnitude of the supply appear to bear comparison with that of the Pennsylvanian district.

From natural gas, the President passed on to deal with water gas—a lighting and heating agent with which Leeds has now become identified, from its manufacture and employment by Mr. Samson Fox. He explained that numerous technical applications of water gas had been suggested, with no very important results, excepting with regard to its use for lighting purposes. Being itself non-luminous, its utilization in this direction was accomplished either by mixing it with a highly luminous gas, or by causing a hydrocarbon vapour to be diffused through it; or its flame was made to raise to incandescence a suitably-prepared solid substance, whereby bright light was emitted. The President went on to say that the objection to the employment of water gas as an illuminant for use in buildings, to which great weight is attached, and rightly, by English people, as sad experience has shown—viz., that, as it consists to the extent of about one-half of its volume of the highly poisonous carbonic oxide gas, the atmosphere in a confined space may be rendered irrespirable by a small accidental contamination with water gas, by leakage or otherwise, not detectable by any odour—appears to constitute no great impediment to its employment in the United States, as about three-fourths of the illuminating gas supplied to the cities of New York, Brooklyn, Philadelphia, Jersey, St. Paul, and Minneapolis is carburetted water gas, while in Chicago the entire supply now consists of this gas, and Boston will also soon be supplied exclusively with it. Sir Frederick remarked that the use of water gas for metallurgic work did not appear to be contemplated in the United States, but it was especially to such applications of the gas that much attention had been devoted in Leeds; and although some eminent experts were sceptical regarding the attainment of advantages, especially from an economical point of view, by the employment of this form of gaseous fuel, especially after practical experience in the same direction acquired in Germany, the technical world must, he thought, feel grateful to Mr. Fox for his work in this direction.

The concluding portion of the address was devoted to a review of the position which Leeds has taken in the matter of technical education, and to a discussion of the advantages of natural history museums; the establishment of the Imperial Institute—the conception of H.R.H. the Prince of Wales—being especially alluded to, as occupying a central position among the buildings devoted to the illustration and cultivation of pure and applied science and art at South Kensington.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Official Report of the Proceedings at the Annual Meeting at Perth.

We complete to-day the Official Report (commenced in the JOURNAL for the 26th ult.) of the proceedings at the recent annual meeting of the above-named Association, at Perth.

At the close of the discussion on Mr. Robertson's paper, on "Internal Gas-Fittings," given in the JOURNAL for July 29,

Mr. J. M'GILCHRIST (Dumbarton) read the following report of the Committee on

SELLING GAS.

Your Committee, in reporting on Mr. M'Gilchrist's paper on "Selling Gas," think it proper at the outset to point out the extraordinary coincidence that Mr. Edwards, of Napier, New Zealand, had all but given practical effect to the various contentions in the paper referred to, and to thank him for his ready courtesy in confirming the arguments in favour of the "Ideal Gas Company."

While approving generally of the arguments advanced by Mr. M'Gilchrist in his paper on "Selling Gas," your Committee are of opinion that, although it would be very interesting and instructive to review and report upon these in detail, yet far more practical advantage would be gained by at this time simply tackling what is unquestionably the greatest of all bugbears in the way of selling gas—namely, what should be the proper dimensions of gas-pipes for dwelling-houses and other buildings. This your Committee consider a matter of sufficient importance to be treated by itself, as its settlement upon a proper basis will tend materially to strengthen the gas interest in the public mind, by giving our light that fair play which, from an illuminating point of view, it deserves, and creating a spirit of contentment amongst consumers. It is, as we all know, not a satisfactory thing to have "too many irons in the fire;" and, besides, any of the other points in the paper alluded to might well form the subject of a communication at any future meeting of the Association.

Unfortunately, nearly all gas companies and gas corporations permit gas-fitters and other irresponsible tradesmen to fit up houses and other buildings with pipes and fittings without ever considering whether the sizes of pipes used are sufficient to give an efficient supply of gas. The evils attendant upon this system have long been known to all taking an intelligent interest in the utilization of coal gas; and it would be a simple waste of time to give in detail the many stupid and inexcusable blunders that have been, and are still being perpetrated in this direction. Let us rather make a resolute and determined effort to bring this highly unsatisfactory state of matters to an end by adopting a universal standard in the sizes of pipes to be fitted into our houses—sizes which will be at once economical in the consumption, and give efficient and satisfactory results to the consumer. To have a universal standard enforced all over the kingdom will, no doubt, meet with opposition, as many gas-fitters (from an interested point of view) will raise their voices and use their influence against it. To have this standard adopted without resentment would perhaps require parliamentary powers to be given to gas companies and corporations, to fit up all pipes between the main and the consumers' burners; but there is no immediate prospect of such powers being given. Your Committee, however, think the object aimed at can be attained, if only a united, hearty, and persistent effort be made on the part of gas managers in the direction indicated; and they recommend the following standard of sizes for internal pipes, and would respectfully call upon all having any authority in the matter to insist that it be adhered to:—

Internal Diameter of Pipe. (Inches.)	Greatest Length of Pipe Allowed. (Feet.)	Greatest Number of Burners for Size and Length of Pipe.
⅜	20	3
½	30	6
⅝	40	12
¾	50	20
1	70	35
1¼	100	60
1½	150	100
2	200	200

N.B.—No ¼-inch pipe to be used.

Your Committee have little doubt that there will be some hostility at first to this standard on the part of proprietors of house property; but they would speedily realize the great benefits they would derive from adopting it, and would soon give up their opposition. In Dumbarton, the battle had to be fought long ago; but the victory was on the side of the Gas Corporation, and now they have little trouble in the matter. They insist upon pipes of the same dimensions as those of the standard now recommended being put in; and, indeed, in several cases where pipes of too small capacity were

fitted up, they have caused them to be taken out, and in all cases at the gas-fitter's expense.

We have a duty to perform to our consumers, as well as to ourselves. We should therefore have the courage to carry it through; and if we have this Association at our back, nine-tenths of the battle is gained. United action is what is wanted. The Association might well afford to print the suggested standard of sizes, and supply managers all over the country with a copy.

In conclusion, in Scotland, England, and Ireland, and indeed in all places where gas is consumed, the same complaints are heard. If Scotland has in the past led the van in many good works, say will you lend your support that she may yet claim the honour of being the first to successfully cope with the evil pointed out here, and, by putting it down, perform another good service to the public and the gas industry.

The PRESIDENT: You have heard the report of the Committee; and I would strongly impress its recommendations upon you, with the view of obviating the complaints which arise in reference to the different sizes of pipes. Of course, we cannot compel parties to accept these recommendations; but every sensible house proprietor will see that it is for his own interest to adopt the standard sizes of pipes. Builders, architects, and others who are not so familiar with the actual size of pipes required, will be very much assisted by this report; and if it comes as a recommendation from this Association, it will have much greater effect than if it merely came from a gas manager. While I do not think that a manager should go beyond his province, there is no doubt whatever that it would be of great advantage if architects were to consult him as to the standard size of pipes to be used. The intention of the Committee is that copies of the table contained in the report should be sent to every gas manager, so that he may be able to draw the attention of architects, builders, and others to it. I beg to move the adoption of the report.

Mr. W. MACKENZIE (Dunfermline), in seconding the motion, expressed the hope that advantage would be taken of the recommendations.

Mr. J. HALL (St. Andrews) said he was glad the recommendations had been made by the Association, and great benefit would, no doubt, result from gas managers showing them to every architect and plumber in their several localities. There was no part of the report he (Mr. Hall) liked so much as the note to the effect that no ¼-inch pipe was to be used.

The motion was unanimously adopted.

MR. LAWRENCE HISLOP'S PAPER.

Mr. L. HISLOP (Uddingston) then read the paper entitled "Our Guide to the Purchase of Coal, with Remarks," which appeared in the JOURNAL for the 12th ult. (p. 350); and it gave rise to the following

Discussion.

Mr. J. M'CRAE (Dundee): We are very much obliged to Mr. Hislop for reading this paper, which bears the stamp of originality. Such a subject has seldom been dealt with in this or any similar Association. It is a peculiar circumstance that gas managers do not care to say much about the purchase or analysis of coal. Mr. Hislop has, perhaps, been rather hard upon the analyst; and I think undeservedly so, because coal-masters are not expected to send the worst samples to the analyst. No doubt the coal-master selects the purest specimen; and it is for the gas manager to see that he gets a fair sample all through his contract. It is a fact that coals vary in their qualities. There are in most collieries "faults," or what we call "dykes;" and at these points the quality of the coal falls off to an alarming extent, so that the coal may be worse towards the end than at the beginning of a contract. The coal-master and the analyst may therefore be correct; and it is the duty of the gas manager to raise his voice when he finds any deterioration. The process to be employed in analyzing should be the same as is adopted in gas-works on a large scale. The chemist deals with a small quantity of coal, and the gas goes through any number of lime-trays, and perhaps some other caustic, so as to thoroughly remove every trace of carbonic acid. This, however, cannot be accomplished on a large scale. We may use oxide and lime, and yet leave a certain percentage of carbonic acid in the gas, which accounts for the difference between the laboratory test and the practical test. The analyst does his best for the coal-master; and he is perfectly right in doing so. That, however, is no reason why we should condemn the analyst. There is one sentence in Mr. Hislop's paper in which he says: "Many of these coals we have been long familiar with; and whatever analyses of them may now be obtained, we should not allow ourselves to be deceived." I do not think Mr. Hislop believes that the coal-masters are trying any deception on gas managers; nor do I. My experience goes to show that if you draw the attention of any coal-master to the fact that his coal is deteriorating in quality, he is as anxious to discover where the fault lies as is the buyer of the coal. That is my experience. The whole subject has a peculiar interest for me, because during the past month or two I have submitted an analysis of various coals which were tested on the lines laid down by Mr. Hislop; only I have gone further than he does. He gives us in Table II. several mixtures of cannels. I presume these cannels are taken from Table I.; but he does not say which of them he has adopted for his mixtures. He has given us ten different mixtures, and has told us there are four kinds of coal; but he does not inform us what coal is in the mixture, and consequently the statement falls to the ground. According to Table I., the cost of that coal is 7s. 8d. per ton; and the cost per 1000 cubic feet of gas, 8·65d. The question comes to be whether, if Mr. Hislop has paid that money for the coal, it is the best value, all things being equal. Then I have to ask what amount he has debited that coal with in lieu of the loss of the coke which would otherwise be of service? That is a point his paper does not show. At the same time, I think he has done good in bringing the question before us. Of course, I would not ask the members to believe that the two analyses he gives are at all to be considered representative. It would be a serious thing for you to buy coal which is expected to give you 10,840 cubic feet of gas, and find that it only yields 8860 cubic feet, and which is supposed to produce 28-candle gas, while it only gives 20-candle. I hope Mr. Hislop does not mean to bring this forward as typical of the state of the whole market all round. I multiply the production of gas by the quality; so that by running up the column you see which is the highest number, all other things being equal. I wish Mr. Hislop had gone a little further, and given us more details [Mr. Hislop signified dissent]; but I see that he shakes his head when I ask the names of the coals that form the mixtures.

The PRESIDENT: You can scarcely expect him to state that.

Mr. ANDREW M'CRAE (Monifieth): I think it is a common-sense thing to put more faith in practical analysis than in laboratory experience. I may mention that in my small experience, as a coal agent, of cannel coal, I send waggon-loads to the gas engineers without making any selection, and ask them to use the whole of the coal in one shift and give me the result. Then I take the average of each test, and arrive at what I consider a very fair analysis. This is what ought to be given out to those who have not an opportunity of analyzing for themselves. This is the most straightforward and honest way of thoroughly testing the coal. There will be "dykes" and "faults" in any seam; and it is the duty of the coal-master and of the gas manager to detect these flaws as far as possible. I think the plan I have pursued for a number of years is the proper one; and it gives satisfaction to all consumers.

Mr. A. SMITH (Aberdeen): I think Mr. M'Crae has put the matter very fairly indeed. I do not believe any coal-master would try to deceive us. We know that the quality of coal deteriorates at times; but if there is any complaint I would make, it is as to changing the name of the coal. We find that a very old standard coal comes to us under a new name; and when we purchase and analyze it, we discover that it is only an old friend with a new face. I really think this is a mistake; and coal-masters should see it to be their duty to prevent it.

Mr. D. VASS (Portobello): In comparing the shale with the cannel coal, does Mr. Hislop made an allowance for condensation in the mains?

The PRESIDENT: That question is scarcely before us, but no doubt Mr. Hislop, in his reply, will deal with it. I am of opinion that we should go by the practical working analysis. Everyone's work differs from his neighbour's. If a manager employs three-hour or four-hour charges, he cannot expect the same results; and as we do not all work in the same way, these analyses cannot be expected always to agree with each person's own experience. Everyone, in buying coal, should test for himself what it will produce with him, and not with anybody else. It is what will suit my purpose that I want; and it is better for each to judge for himself.

Mr. HISLOP: Mr. M'Crae's question is as to the delivery of the coal. We are very often under the necessity of taking delivery at railway stations, or by boat or otherwise. In taking delivery we may complain that we have not received the coal we would like; but I do not mean to convey the idea that any coal-master wilfully deceives us. It is for us not to allow ourselves to be deceived by any new analysis of a coal that has been long in the market, though it comes to us under a changed name. The allowance I make depends on the price at which we sell the coke; but I may mention that, in compiling the table, I allowed 6s. per ton against the shale in lieu of coke, labour, the increased gas, purification, &c. With regard to Mr. Vass's question, I may say that I take good care to work shale in a very hot retort; and I do not think there is much chance of condensation in the mains.

The PRESIDENT proposed a vote of thanks to Mr. Hislop for his paper; and the motion was carried with applause.

At this stage an adjournment was made for luncheon. In the interval, the Scrutineers (Messrs. Smellie and Adamson) examined the papers for the election of office-bearers and fixing the place of meeting for next year. On reassembling, their report was read. It showed that the undermentioned gentlemen had been elected as the

OFFICE-BEARERS FOR 1890-91.

President—Robert Robertson, Bathgate.

Vice-Presidents—Adam MacPherson, Kirkcaldy; T. D. Hall, Montrose.

Secretary and Treasurer—Robert S. Carlow, Arbroath.

Committee—The above-named office-bearers in association with Messrs. G. R. Hislop, Paisley; W. Key, Tradeston, Glasgow; and J. M'Crae, Dundee.

Mr. ROBERTSON briefly thanked the members for the honour they had conferred upon him in electing him to the office of

President, and assured them that nothing should be wanting on his part to advance the interests of the Association.

PLACE OF NEXT MEETING.

It was decided to hold the next meeting of the Association in Edinburgh.

MR. TERRACE'S PAPER.

Mr. J. B. TERRACE (Brechin) then read his paper on "Retorts Contracted at the Back End," which appeared in the JOURNAL for the 19th ult.; and it led to the following

Discussion.

Mr. A. NAPIER (Crieff): I do not see how the contracting of the retort as proposed will prevent the deposit of carbon, or enable us to clear our retorts more readily. So far as I have ever heard, the experience of Mr. Terrace is exceptional. There is no doubt that if, after drawing the charge, he waits for 36 hours, the retorts will readily open up; but by leaving the charge in, and slackening and scraping, the carbon should readily come off after 12 or 18 hours at the outside. I am much more interested in the formation than in the removal of the carbon; and it would be interesting to know at what pressure Mr. Terrace works, and the causes of such an excessive deposit.

Mr. T. WHIMSTER (Perth): Mr. Terrace has done well in bringing this subject before us. I believe it is the universal experience—at least to begin with—that carbon is troublesome, and especially at the back end of the retort. It seems to cling with a native tenacity to it; and there is no getting it out. I think the proposed construction of the retort is calculated to relieve the carbon, and allow it to come away more easily. I approve of the form suggested by Mr. Terrace for the back end of the retort for that purpose; but I should say that to allow carbon to accumulate in the retort undisturbed for eight weeks is not wise. Our practice in Perth has been to scurf the retorts for three days in succession after beginning to charge them; and by this means we get a glaze on them, so that the carbon does not take root as it does in a new retort. We could take off about ¼ inch of carbon with the greatest ease, as it comes away like ice from front to back. By careful attention, and never missing a week except under special circumstances, we never had any trouble. We only had 1 inch of carbon at the outside; I never saw from 3 to 5 inches.

Mr. J. BALLANTYNE (Rothesay): One of my objections to Mr. Terrace's system is that it reduces the size of the back end of the retort, where the heaviest charge should be; and in this way it would tell against the full quantity of coal going into the retort. In my opinion the carbon would accumulate in the contracted end as readily as in the full end.

Mr. M'GILCHRIST: If by adopting Mr. Terrace's patent you get rid of 5 inches of carbon, the invention is worth a good deal of money; but surely these 5 inches of carbon are peculiar to Brechin. I never knew of a retort covered with carbon to the extent of 5 inches. If there are any other managers troubled in the same way as Mr. Terrace at Brechin, they should adopt his patent, if it will rid them of the 5 inches of carbon.

Mr. T. D. HALL (Montrose): I think Mr. Terrace's proposed form of retort is of importance; but I do not think he means that by adopting a contracted retort we shall reduce the accumulation of carbon. I can easily see that if we get the carbon that has accumulated at the top of the retort broken into two it will be easy to take it out. We have no difficulty in breaking the block at the top of the retort, but we have in getting it away. By Mr. Terrace's plan, after you have accomplished the breaking, the material will be more easily taken out.

Mr. M'GILCHRIST: I work on just the same principle as Mr. Whimster—having the carbon scraped out weekly; and we do not experience any difficulty.

Mr. T. D. HALL: Mr. Terrace's patent is not to prevent the accumulation of carbon, but to facilitate its removal. I wish to know why there should be such an accumulation. The exhauster is employed to reduce the carbon; and gas managers who have a little carbon to remove should follow Mr. Whimster's practice of cleaning the retorts frequently. I make it a rule to do this twice a week—every Tuesday and Friday—sometimes more frequently after they are first used, so as to get a glaze on them. I also wash them with cement; but I cannot say that this is an improvement. Sometimes I think it is an advantage; while at other times I fail to see any benefit. I think Mr. Terrace has adopted a very sensible plan. The reduced quantity of coal is very trivial, because it is only the bottom of the retort that is affected.

Mr. A. MACPHERSON (Kirkcaldy): It appears to me that Mr. Terrace has devised an expedient for getting rid of what he never should have. If he allows the carbon to grow to the extent of 5 inches on the top of the retort, he lets it go far too long; and a better expedient would be to follow the method adopted by Mr. Whimster and Mr. Hall, and have more frequent scurfing. By scurfing, the retort is less damaged than by scraping. The retort will not last so long with the use of a heavy bar as by cleaning it out once or twice a week. At the same time, if Mr. Terrace finds it to be more profitable to let the carbon grow to the extent of 5 inches, and then use his patent, he is quite right in introducing it. Mr. Terrace should go a step farther and prevent the deposit of the carbon. How long does it take to accumulate?

Mr. TERRACE: Eight weeks.

Mr. MACPHERSON: Well, if Mr. Terrace has an exhauster, he should only have 5-10ths pressure, because there is nothing to prevent him working at 2-10ths. What reason he has for maintaining 2 inches of pressure in his exhauster, I cannot understand. If he will draw within 2-10ths of the level, he will find that the deposit will be prevented.

Mr. HALL (St. Andrews): The meeting must not suppose that we have no carbon at all. There is still carbon in my retorts, although they are cleaned out frequently; and it is at the back end, either at the top or the bottom, that the difficulty arises in removing it, scrape it as we may.

Mr. MACPHERSON: You will easily remove the deposit by the simple application of a little cold water.

Mr. A. SMITH (Aberdeen): The carbon at the back end of the retort should be more easily taken out when the retort is tapered; but I cannot see why there should be such a large quantity of carbon, even in eight weeks' time. Mr. Terrace must have a great deal of back pressure. I know that when retorts are washed with Sellars's cement they do not require cleaning for about a month; and even in that time we cannot get the iron to take hold of the small amount of carbon there is at the end of the retort. Mr. Terrace must be working with a very heavy back pressure; and if he were to prevent this deposit of carbon upon the retort, he would find an advantage in the increased illuminating power of his gas.

Mr. HALL: How does Mr. MacPherson introduce the cold water?

Mr. MACPHERSON: It can be introduced in any convenient method. I do it by means of a large syringe.

Mr. J. WHIMSTER (Armagh): The accumulation of carbon at the back end of the retort is due to the excessive heat that exists there. I make a determined effort to draw the heat from the back end; and by keeping the retort a little cooler, I do not have the same accumulation of carbon that I was accustomed to have. I followed the practice I learned in Perth, of having the retorts scraped every week; and I found that it did very well, though sometimes the lump gathered, and the workmen could not scrape it off. The scraper slipped over it; and I did not like to apply the bar and the sledge-hammer, lest they should damage the retort. If I could not get the carbon down by frequent scraping, I allowed it to grow perhaps for six months, and then burned it out by putting in an old main-pipe, covering it up with lime, and sealing the front, when a day would be sufficient to make the carbon come off clean.

Mr. TERRACE: I am glad my short paper has elicited so full a discussion, as we are often more benefited by this than by a paper. Mr. Napier speaks of clearing his retort in twelve hours. I shall be glad to give his plan a trial. I may state to Mr. T. Whimster that I do wash my retorts with cement, to put a glaze upon them; but it does not affect them. Mr. Ballantyne spoke of the contraction reducing the area of the retort; but I may mention that it amounts to scarcely 0·1 of a cubic foot. I may also say that if there is any royalty attached to the patent, I shall waive my rights to it. Mr. Hall, of Montrose, who referred to the back pressure, spoke as if he, too, had been troubled with an accumulation of carbon; and I should like to know his experience. I may tell Mr. Hall, of St. Andrews, that we wash our retorts. He does not have an exhauster, but we have one at Brechin. We manufacture something like the same quantity of gas as Mr. Hall—about 20 million cubic feet. I believe in a little back pressure; and I keep it from 1 inch to 1½ inches.

Mr. SMITH: But ¼ inch is quite enough.

Mr. TERRACE: In answer to Mr. James Whimster, I may say that we have a strong heat at the back of the retort, where the accumulation of carbon takes place, but that it is not quite so great now as it was when I first went to Brechin. I would clean the retorts every week if I thought it would effect any improvement; and I brought forward my paper with the view of eliciting the remarks of the members.

The PRESIDENT: It is peculiar that the carbon takes a sort of rounded form. The whole question of cleaning and working in this fashion brings back to my mind the fact that we are still peddling away in the old style, like a baker shovelling loaves into an oven. In large works we should have a better system of drawing the charges. We are not yet working on the right lines. While appreciating the care and anxiety shown in cleaning out the carbon, I think other means should be adopted for getting rid of it. I have to ask you to accord a hearty vote of thanks to Mr. Terrace for his interesting paper.

The proposition was carried with applause.

MR. LITTLE'S PAPER.

Mr. T. D. HALL (Montrose) then read the paper contributed by Mr. Gilbert Little, of London, on the "Transit of Materials in Gas-Works," which will be found in another part of the JOURNAL to-day. It gave rise to the following

Discussion.

The PRESIDENT: The application of machinery for the conveyance of materials from one part of a works to another is not of very great importance as regards Scotch gas-works, which, as a rule, are small; and the saving would not be much appreciated except in works on a large scale. This is therefore a

matter for the engineers and managers of big works rather than for the general members of our Association.

Mr. D. M. NELSON (Glasgow): I may say that, having the honour of regarding Mr. Trewby as a personal friend, I some years ago had the privilege of being on his works, and I can supplement the statements in the paper by saying that I never witnessed anything so complete as the transit of coal from the ships or steamers in the Thames on to the jetty, from the jetty into the works, and from the works into the retorts. It is a wonderful system of mechanism; and the skill and ingenuity displayed in this complete and economical method of lifting coal straight from the steamer, and putting it into the retorts, are most extraordinary, and redound with credit to the brain of the inventor. I was specially impressed by hearing this paper after having had the privilege of personally seeing the works; and I should have been wanting in common gratitude had I failed to say a word in reference to the scheme, which, if not promoted originally by Mr. Trewby, was at least consummated by him. I have much pleasure in testifying my appreciation of the paper.

Mr. A. SMITH (Aberdeen): Not having had the advantage, like Mr. Nelson, of a personal inspection of the works, I failed to grapple the subject fully; and I should like Mr. Little to explain his plans. We need to break our coal; and I wish to know what is done according to this system.

Mr. NELSON: English coal does not require breaking.

Mr. LITTLE, after explaining the details of the system, stated, in answer to the President, that the iron tubes along which the hot coke was carried were ⅜ inch thick; and in his experience the iron plates were not affected by the temperature.

Mr. M'GILCHRIST: Mr. Little has brought before us an important communication. The labour question is one of the burning questions of the day; and the labourers of the gas-works around London seem to appreciate this patent, for they have struck work, and will not do anything where this labour-saving apparatus is used. We know that, when machinery was first introduced, the labourers of that day thought it their enemy, and struck work against it; and I think it augurs greatly in favour of this patent when the labourers will not assist it in any way. I hope Mr. Little will be able to show us models as well as drawings of this new apparatus, which would enable us more fully to understand the *modus operandi*.

Mr. SMITH: The President, in his excellent address, recommended that we should give attention to the charging and drawing of retorts by machinery; and that is why I was anxious to get more information on this subject, seeing that we are fitting up machinery at our works in Aberdeen.

The PRESIDENT: I have no doubt that, after Mr. Smith has completed his new arrangements, some of us may be able to go to Aberdeen and inspect them. It would, of course, be of great advantage to the members if they saw Mr. Little's plans working, because from actual work one can get a better comprehension of the subject than from mere plans and models. I will ask you to give a very hearty vote of thanks to Mr. Little, to whom we are deeply indebted for coming all the way from London, at much personal inconvenience, to give us this information about these new appliances.

Mr. LITTLE, in returning thanks, said that perhaps on a future occasion he might have models prepared, as Mr. M'Gilchrist had suggested.

REGENERATIVE FURNACES.

The PRESIDENT: We have now reached the end of our papers, with the exception of one, on "Regenerative Furnaces," by Mr. Klönne, of Dortmund, Germany. Mr. Klönne telegraphed that he expected to reach Perth by eleven o'clock this forenoon; and some delay must have occurred to prevent him keeping his appointment. I am sure we all regret that he is not here, after travelling specially from Germany to this country to meet us.

Mr. M'GILCHRIST proposed that the paper should be accepted and published in the Transactions; remarking that Mr. Klönne had paid a great compliment to the Association in offering to contribute a paper.

Mr. MACPHERSON suggested that, if Mr. Klönne arrived, his paper should be read after dinner.

These suggestions were unanimously approved of.

THE PRESIDENT'S MEDAL.

Mr. J. M'CRAE (Dundee) then said: As one of the latest Past-Presidents of the Association, a pleasant duty has been assigned to me. There are many here who could perform that duty with greater acceptance; but I would yield to no one in more heartily and cordially presenting the President's Medal to Mr. Stewart. It would be idle for me to make any remarks as to Mr. Stewart's amiability and goodness. When he speaks, he always says something worth listening to; and we all like him. In handing over this medal, I would express the wish that Mr. Stewart may be long spared to adorn our profession, of which he has been an ornament for so many years.

The PRESIDENT: It gives me the greatest pleasure to accept this medal; and I thank the members very cordially for the gift. It has become a sort of formal matter to present a medal to each President; but it is gratifying to one to know that he is so highly esteemed by his professional brethren as to be chosen to the presidency of an Association so important as this. Our Association does not have so large a membership as The Gas Institute. But it is the parent Association; and I think the papers submitted to us are equal to any that are laid before any other similar society. Certainly, The Gas Institute has never produced anything better. When our brethren in the South want a man of skill, science, or ability, they generally come to the North for him. The English Institute is composed of men of ability; and it is gratifying to know that we are so much appreciated by them. It is also pleasant to see that the new Council of the Institute includes several of the members of this Association. This is the second time I have had the honour of being your President; and I feel it to be a high honour indeed. This medal will remind me of our pleasant meeting; and I beg to thank all the members for their kindness, and for the gift of this valuable *souvenir*.

THANKS TO THE SECRETARY AND THE SCHOOL BOARD.

Mr. W. MACKENZIE (Dunfermline) proposed a hearty vote of thanks to the Secretary, Mr. Carlow, for the great labour he bestowed in getting up the meetings of the Association.

The PRESIDENT, in seconding the proposition, said no one could do more than Mr. Carlow for the Association.

The motion was heartily carried.

Mr. CARLOW, in returning thanks, said he had always received the greatest kindness at the hands of the members. What he did was done with the greatest good-feeling; and it would always be his endeavour to promote the success of the Association.

The PRESIDENT then moved a vote of thanks to the School Board and Dr. Thomson for granting the use of the hall in which the meeting was being held—a privilege for which the Association were doubtless indebted to the appreciation in which Mr. Whimster was held.

Mr. MACPHERSON seconded the motion, and it was unanimously agreed to.

VOTE OF THANKS TO THE PRESIDENT.

Mr. MACPHERSON proposed a hearty vote of thanks to the President, for the efficient and admirable manner in which he had discharged his duties. The members had, he said, listened with pleasure, and he was sure with profit, to the President's opening address; and he had conducted the whole proceedings in such a manner as to reflect great credit on himself.

The proposition was very cordially received.

The PRESIDENT, in acknowledging the vote, expressed the hope that the future of the Association would be as brilliant as its past had been. They could not expect to increase their numbers much more, because most of the gas managers in Scotland had been already admitted; and he did not think that it would be advisable to introduce foreign members. When one Association became mixed up with another, there was great likelihood of their usefulness being destroyed. They had always held a prominent part, as Scotchmen, in the Association; and he would impress upon the members the necessity of abiding by this principle in the future.

In the evening, the members dined together in the Royal George Hotel—Mr. Stewart presiding, and Mr. R. Robertson and Mr. J. M'Crae being Croupiers. The toast of the evening—"The North British Association of Gas Managers"—was proposed by the Chairman, and responded to by the President-Elect (Mr. Robertson). The following day was spent in a drive from Perth to Meikleour and Craighall. The weather was favourable; and the excursion was a very pleasant one.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Quarterly Meeting at Lancaster.

As stated in the last number of the JOURNAL, the Eighty-third Quarterly Meeting of the above-named Institution was held on Saturday, the 30th ult., at the Town Hall, Lancaster, the use of which had been kindly granted by the Mayor (Mr. Alderman T. Preston). The chair was occupied by the PRESIDENT, Mr. W. W. Hutchinson, of Barnsley.

The formal proceedings commenced with the reading, by the HONORARY SECRETARY (Mr. S. S. Mellor, of Northwich), of the minutes of the previous meeting, held on the 17th of May, at Matlock Bridge; and they were duly confirmed.

Three new members recommended by the Committee—viz., Mr. Walter Whatmough, Manager of the Heywood Corporation Gas-Works; Mr. John Swan, Manager of the Ulverston Gas-Works; and Mr. Timothy Duxbury, Manager of the Middleton Gas-Works—were then unanimously elected.

THE UTILITY OF WATER IN GAS MANUFACTURE.

The next business was the discussion of a paper presented at the meeting held on Nov. 30, 1889, by Mr. T. NEWBIGGING (Manchester), on the above subject, and given in the succeeding number of the JOURNAL.

The PRESIDENT expressed regret at the necessarily long delay between the presentation and the discussion of the paper.

Mr. J. HEPWORTH (Carlisle) remarked that he had pleasant recollections of having read the paper when it was published nine months ago, but had not read it since, and could contribute little to a discussion upon it. Mr. Newbigging covered the ground exceedingly well; and there was no part of the process of gas manufacture where water could be used wisely and well to which he did not call attention. He (Mr. Hepworth) thought it an interesting paper, and read it with much gratification; not thinking at the time that he should have the opportunity, as he had now, of thanking Mr. Newbigging.

Mr. THOMAS DUXBURY (Darwen) agreed with Mr. Hepworth that the paper suffered, so far as the discussion was concerned, from the fact that it was nine months since it was brought before them. Most of them, he feared, had forgotten the substance of it, though they agreed with Mr. Hepworth that it was exceedingly well treated. There were some points upon which Mr. Newbigging might be able to throw a little more light. He mentioned, for instance, the use of water in connection with lime and oxide of iron for the purification of gas; and it would add to the value of the paper if he could give some information as to the proper consistency of the lime or oxide of iron on the admixture of water, so as to produce the best results. One peculiarity pointed out in the paper had never occurred to himself. It was that in the retorts the coal gave off moisture, and two contrary actions took place at one and the same time—an analytical and a synthetical process. In the one case, they had oxygen and hydrogen combining to form water; and in the other, the moisture was being separated into its constituent gases, and went forward as one of the elements of coal gas. It seemed a great anomally, and one which he could hardly reconcile, that there should be two processes of an opposite nature going on simultaneously in the same vessel. There was yet another point about which he should like some more information. Mr. Newbigging stated that the ammoniacal liquor was an agent by which they could remove from the crude gas a portion of the carbonic acid and sulphuretted hydrogen. He should like to know if Mr. Newbigging was acquainted with any system by which these impurities—sulphuretted hydrogen and carbonic acid—could be removed from the ammoniacal liquor when it became charged with them. If there were any method of doing this, it would save the purifiers some of the work they had to do, and the ammoniacal liquor would be more valuable.

Mr. ISAAC CARR (Widnes) said this was certainly a somewhat difficult paper to discuss, because there was not very much debateable matter in it. Mr. Newbigging referred to the quantity of water produced from the coal in the process of distillation. His experience was that this depended entirely upon the degree of temperature at which the coal was carbonized. If the temperature was high, the quantity of water evolved was reduced. A demonstration was afforded of this fact in stopped ascension-pipes, due to the decomposition of the water. In his opinion, the only remedy for this was to run water down the pipes. This fell into the mouthpiece of the retort; and, as it evaporated, it filled the place of the water which decomposed, and so cleared the pipes. As to the utility of water in the ash-pan, he quite agreed with Mr. Newbigging's statement that without water the best results could not be obtained. Experience proved that water, applied in the form of steam, had the best effect in obviating the formation of hard clinker. A jet of steam injected underneath the bars of an ordinary furnace would prevent clinker from forming hard; and if injected underneath the bars of a producer furnace, would altogether prevent clinker from forming. The reason was not far to seek. In the ordinary ash-pan, the steam which prevented the clinker forming rose from the water in the pan; but as clinker began to collect, the quantity of steam given off was reduced, and as the reduction in the supply of steam continued, a hard clinker formed. On the other hand, if the steam came from a boiler, it was passing in all the time, and the temperature at the bottom of the furnace was kept so reduced that hard clinker could not possibly form, and the ash could be brought down almost as soft as that of an ordinary house-grate. In some settings put up by Mr. W. R. Chester, at the Nottingham Gas-Works, no clinker whatever formed. The clinkering-bar was discarded entirely; and a hook was used to rake down the ash. This proved the efficacy of steam as applied to furnaces; for it needed no words of his to enlarge upon the advantages of being able to do away with clinkering.

The PRESIDENT agreed with the remark which had fallen from a previous speaker that the paper did not lend itself very well to discussion at length; for Mr. Newbigging had threshed the subject out so thoroughly, and his conclusions were so obvious, that there was little room for difference of opinion. As to Mr. Carr's remarks on the use of steam to prevent the formation of clinker, it occurred to him to ask if the coals of which he spoke were all of the same sort. Some kinds of coal produced clinker freely; while others caused less. As to sulphuric acid, they were all aware that it had little or no effect unless it was allied with water to give it the condition of action.

Mr. NEWBIGGING, in the course of his reply on the remarks that had been made, said: We have not had a lengthy discussion on the paper, but that was scarcely to be expected; and I think you will agree with me that, considering it was not on an abstruse and out-of-the-way subject, the discussion has not been without interest. This should be an encouragement to members not to hesitate in bringing forward at the meetings a paper on any question, however simple, in which they take special interest, and on which they have something to say. And here I may take the opportunity of expressing my dissent from opinions that have recently been promulgated, to the effect that the subjects for discussion at meetings of this kind are becoming hackneyed and threadbare. I take exception to that view. Let us not get into the habit of imagining that all has been said that can be said on the different appliances and processes of gas manufacture. If there is a dearth of material for discussion, it certainly is not due to our having sounded the depths of the various processes, and exhausted their secrets. It is rather because we are failing to apply our minds to the study of the processes as deeply as we might and ought to do. There is not one of them—carbonization, condensation, purification—but can still afford material for endless research and discussion before their *rationale* will be exhausted. But this is a digression. Mr. Duxbury has referred to my suggestion that two opposite processes are going on simultaneously in the hot retorts—the analytical and the synthetical; and he would like to have further assurance of it. Well, on a matter of this kind we can only reason from analogy. We cannot get into the retort to observe its working; but it is reasonable to conclude that the steam rising from the coal is decomposed into its constituent elements, and, on the other hand, that there is less or more of chemical combination taking place between the oxygen and hydrogen, also contained in the coal, in traversing the hot surface of the retort. With respect to the desulphurating of ammoniacal liquor, to make it answer the purpose of continuously absorbing the sulphuretted hydrogen impurity from the crude gas, that is precisely the process which Mr. Hills and Mr. Livesey attempted to perfect, and also the identical process—that of Claus—which is in use at the Belfast Gas-Works at the present time. Mr. Carr is of opinion that the quantity of water produced in the carbonization of coal depends on the temperature of distillation. No doubt that is so; but as the temperature employed is fairly uniform at most gas-works, it may be expected that the yield of water will also be much about equal—making allowance for the varying character of the coals. Mr. Carr finds that steam is more useful than water underneath the grate-bars, in preventing the formation of clinker. I agree with that. But it is more costly than water; and, after all, steam is only another form of water. Perhaps the best arrangement to prevent clinker formation is to inject a fine stream of water (in the shape of spray, if possible) into the mass of hot material at the bars, or, where there are no bars, into the base of the furnace.

MR. SAVILLE'S PAPER.

Mr. G. E. SAVILLE (Todmorden) then read the paper describing his combined washer, tar extractor, and exhaust regulator, which was given in the JOURNAL last week (p. 496).

VOTES OF THANKS.

The PRESIDENT proposed a vote of thanks to the Mayor of Lancaster, for his courtesy in placing the Council Chamber at the disposal of the Institution, and for his hospitality to the members.

Mr. HEPWORTH, in seconding the resolution, said he had known Lancaster for some years, and had watched with very great interest the progress of the Lancaster Gas-Works ever since they came into the hands of the Corporation. He was there at the time they were transferred, and took some small part in the business which was then necessary to be done. This brought him into contact with the late Chairman of the Gas Company—Mr. Roper; and he was exceedingly pleased to see this gentleman's name so well handed down as it was in Mr. Roper's son, the Deputy Town Clerk, who had been most devoted in his labours to make the visit of the Institution to Lancaster pleasant. There was one other gentleman present, a member of the Gas Committee; and he was sure that he and the Deputy Town Clerk would convey to the Mayor their high appreciation of what they had seen at the gas-works under the management of Mr. Armitage, and of what they had received at the hands of his Worship in the way of courtesy and hospitality.

The resolution was carried.

Mr. DUXBURY proposed a vote of thanks to Mr. Alderman Watson, Vice-Chairman of the Gas Committee, and Mr. Roper Deputy Town Clerk, for their services to the Institution.

This resolution was also carried.

Alderman WATSON and Mr. ROPER briefly replied; the latter gentleman remarking that the Lancaster Gas-Works only bore out the opinion which Mr. Hepworth formed of them at the time of the transfer. Under the able management of Mr. Fleming and his successor (Mr. Armitage), they had proved a great success.

Mr. J. CHEW (Blackpool) proposed a vote of thanks to Mr. Armitage, Mr. W. Duff (Morecambe), and the other members of the Committee who made arrangements for the gathering.

The PRESIDENT, in seconding the motion, remarked that the gas-works at Lancaster reflected the highest credit on Mr. Armitage, whose painstaking zeal and ability were manifested in every department.

The motion having been carried, Mr. ARMITAGE briefly acknowledged it.

A vote of thanks was also tendered to Mr. Saville, for his paper, on the motion of Mr. J. BRADDOCK (Ratcliffe), seconded by Mr. ISAAC CARR.

This concluded the formal proceedings; but before the members left, Mr. N. Meiklejohn (Longwood) took the opportunity of exhibiting a working model of his new anti-dip valve, designed to prevent stopped ascension-pipes, and stated that, if used in connection with the Dinsmore process, it would give facilities for opening or closing the duct from the floor-line.

The members then paid a visit to Morecambe; and this brought to a close a very agreeable day.

ILLUMINANTS EMPLOYED IN PARIS.

In the JOURNAL a short time ago we gave some statistics, extracted from the Inaugural Address delivered by M. Hippolyte Fontaine at the meeting of the International Society of Electricians in Paris, in regard to the various illuminating agents employed in Paris in certain years embraced within a period extending from 1855 to 1889. The particulars collected by M. Fontaine were the result of considerable labour; and they gave to his address sufficient interest for our readers to justify more extended reference to it. M. Fontaine commences his address by indicating the sources of the artificial lights employed in Paris—viz., (1) wax and tallow candles, (2) vegetable oils, (3) mineral oils, (4) ordinary coal gas and compressed gas, (5) electricity; and he then proceeds to examine in succession the total quantity of material consumed, the motive power expended, the amount of light produced, and the average quantity of light per inhabitant, in the years 1855, 1872, 1877, 1883, and 1889. The 34 years thus covered were not taken indiscriminately for the author's comparisons, but because this period happened to coincide exactly with the age of the Paris Gas Company. Besides, the figures he collected for anterior periods were not sufficiently authentic to warrant him in making use of them. With this brief introduction, we will follow the author's method of dealing with each illuminant separately.

Candles.—M. Fontaine found the statistics furnished by the *octroi* authorities of Paris grouped in such a way as to make it difficult to ascertain exactly the weight of wax and tallow candles used for lighting included in the total bulk of stearine and spermaceti, tallows, and fats of various kinds, registered. However, according to certain specialists, a close approximation to the truth would be arrived at by deducting 10 per cent. from the first, and 60 per cent. from the second total, in order to obtain the exact weight of candles of both kinds. But supposing an error occurred to the extent of 30 per cent. for tallow, and of 5 per cent. for stearine products, this would have very little effect upon the result of the author's calculations, inasmuch as the use of wax and tallow candles for lighting purposes is insignificant as compared with other illuminating agents. In the following table are given the total quantities of tallow and wax and stearine products employed for lighting in Paris in the five years under consideration:—

Year.	Tallow.	Wax and Stearine Products.
	Kilos.	Kilos.
1855	1,299,572	1,288,213
1872	874,445	3,805,940
1877	670,560	3,599,671
1883	448,800	4,557,446
1889	307,880	4,145,263

M. Fontaine next proceeds to estimate the light-giving value of this bulk of raw material; and for this purpose he takes the decimal candle as his unit, conformably to the decision of the last International Congress of Electricians. The decimal candle is practically equal to 0·1 Carcel; and it requires for its production the consumption of about 8·5 grammes of wax per hour. Allowing for waste, 10 grammes may be reckoned as the approximate consumption. With these data, M. Fontaine estimates the quantity of light furnished by wax and tallow candles per head of the population per annum in the five years mentioned; and his results are given in the following table:—

Year.	Population.	Quantity of Light in Decimal-Candle Hours.	Quantity of Light per Head of the Population.
1855	1,174,346	258,778,500	220
1872	1,851,792	468,803,850	250
1877	2,044,849	427,023,310	210
1883	2,299,193	500,624,460	217
1889	2,389,705	445,314,300	190

These figures show that the use of solid materials as lighting agents has undergone but little change in the past 35 years; but the tendency is in a downward direction. There is, however, one curious point in connection with this branch of the subject which deserves special mention—viz., that in 1855 wax and tallow candles were about equal in position as light furnishers; whereas now the latter scarcely provide one-thirteenth of the quantity supplied by the former.

Vegetable Oils.—In collecting his statistics in regard to vegetable oils, M. Fontaine experienced some difficulty, owing to the fact that, for the purposes of the *octroi*, all kinds of animal and vegetable oil, with the exception of olive, are grouped together, and figure under one total. It was therefore difficult to ascertain the exact proportions employed for domestic purposes, lighting, painting, and otherwise. However, after some trouble, he was able to arrive at the results given in the following table:—

Year.	Population.	Quantity of Animal and Vegetable Oil Entering Paris.	Quantity of Oil used for Lighting Purposes.
		Kilos.	Kilos.
1855	1,174,346	10,535,127	6,894,654
1872	1,851,792	14,682,456	8,951,064
1877	2,044,849	14,210,752	7,871,721
1883	2,299,193	14,579,031	7,451,523
1889	2,389,705	13,588,424	6,180,339

Proceeding, as before, to ascertain the light-value of these figures, M. Fontaine estimated that the intensity of a decimal candle could be obtained for one hour by the consumption, in a good Carcel lamp, of 4·2 grammes of vegetable oil. But seeing that most oil-lamps are less economical than the special type named, he allowed an average consumption of 5 grammes per decimal-candle per hour. Calculating on this basis, he arrived at the following figures:—

Year.	Population.	Quantity of Light in Decimal-Candle Hours.	Quantity of Light per Head of the Population.
1855	1,174,346	1,378,920,800	1174·2
1872	1,851,792	1,790,212,800	966·8
1877	2,044,849	1,574,344,200	769·9
1883	2,299,193	1,490,304,600	648·6
1889	2,389,705	1,236,067,800	517·2

This table shows clearly that vegetable oil, which, before the introduction of gas and the discovery of the sources of petroleum, furnished the greater quantity of artificial light in Paris, and, in fact, everywhere else, has gradually fallen into disuse. From 1855 to 1872, the decrease in oil lighting in Paris was equal to 208 decimal-candle hours per inhabitant, or nearly 21 per cent. In the next period of 17 years, from 1872 to 1889, the diminution reached 452 decimal-candle hours, or nearly 50 per cent. Taking the entire period from 1855 to 1889, it may be said that the quantity of light furnished by oil per inhabitant fell off by more than one-half. This, in M. Fontaine's opinion, is due to two causes—the relative dearness of the product, and the unsatisfactory working of oil-lamps.

Mineral Oils.—It was not until about the year 1865 that mineral oils were practically employed for lighting purposes. This date must, therefore, be taken as the starting point for comparison. Of the bulk of mineral oil sent into Paris, about 95 per cent. of the total consumption is for lighting. In order to obtain the light of a decimal candle with a good lamp, it is necessary to burn 3 grammes of petroleum per hour. With an inferior lamp, having a low rate of delivery, the consumption would rise to 5·5 grammes. An average of 3·8 grammes per decimal candle per hour for ordinary petroleum, and 6 grammes for petroleum spirit—say, a general average of 4 grammes—may be taken. In the following table are given the quantities of artificial light produced in Paris by means of mineral oils during the years 1872, 1877, 1883, and 1889, calculated on the basis of 4 grammes per decimal candle per hour, and a consumption of 95 per cent. of the total bulk of oil being employed for lighting purposes:—

ear.	Population.	Quantity of Mineral Oil used for Lighting.	Quantity of Light in Decimal-Candle Hours.	Quantity of Light per Inhabitant.
		Kilos.		
1855	1,174,346	..	..	..
1872	1,851,792	3,759,556	939,889,000	503·1
1877	2,044,849	5,919,716	1,479,929,000	722·0
1883	2,299,193	11,456,620	2,844,155,000	1214·0
1889	2,389,705	19,084,664	4,771,166,000	1995·0

As will be seen, the use of petroleum as an illuminating agent is increasing very rapidly. In the course of a few years it has arrived at producing a quantity of light ten times as great as that furnished by solid substances, and nearly five times as great as that obtained from vegetable oil. This rapid progress contrasts strikingly with the falling off in the use of the older kind of oil; and it may be attributed to its greater economy in, and facility of application. Although M. Fontaine's object was to bring forward statistics relating to Paris alone, he introduced, in connection with his remarks on the use of mineral oil, a few figures relating to Berlin, which it may be of interest to reproduce. In that city there were consumed last year about 54,000,000 kilos. of petroleum; being equivalent to about 13,500,000,000 decimal-candle hours. As the population of the city is 1,400,000, these figures work out to about 10,000 decimal candle hours per inhabitant, or five times more than in Paris. It is quite possible that there may be some slight exaggeration here, as all the mineral oil sent into Berlin may not be used exclusively for lighting purposes. At any rate, it is an incontrovertible fact that this material is much more used as an illuminant than in Paris. An explanation of this may possibly be found in the high *octroi* duties to which it has to submit in the French capital. The duty varies from 40c. to 50c. per kilogramme; whereas at Antwerp it is only from 15c. to 18c. The removal of these duties, which amount to about

300 per cent. on the value of the article taxed, would undoubtedly lead to a much larger consumption, and give greater importance to what is even now a formidable competitor of the two other lighting agents—gas and electricity—with which M. Fontaine next proceeds to deal.

Gas.—Of all the artificial illuminants, gas is the one most employed in Paris. As our readers are aware, its supply is in the hands of the Paris Gas Company—one of the most important undertakings of the kind in existence—who have practically a monopoly of the business. The price charged is 30c. per cubic metre to private consumers, and 15c. per cubic metre to the Municipality; being equal to 6s. 9d. and 3s. 4½d. respectively per 1000 cubic feet. The Company have to pay a tax of 2c. per cubic metre, or nearly 5½d. per 1000 cubic feet, on all the gas consumed, as well as a rental of £8000 per annum for the occupancy of the subsoil by the pipes necessary for its delivery. In addition to these not inconsiderable sums, they hand over to the municipal authorities half of the profits in excess of 10 per cent. on the share capital. The total benefit derived by the City from the gas undertaking last year amounted to something like 21,000,000 frs., or £840,000, which works out to rather more than 2s. per 1000 cubic feet on the quantity of gas sold for private consumption. The price charged to the ordinary consumers is uniformly 30c. per cubic metre, whether the gas is used for lighting, heating, or motive power. M. Fontaine found it difficult, from the statistics at his disposal, to ascertain exactly the quantity of gas employed exclusively for lighting. However, he made an estimate of the loss by leakage, and then calculated the consumption according to the amount of the tax of 2c. per cubic metre paid by the Company thereon. He next reckoned that the gas burnt in the daytime is exclusively for cooking and heating purposes; and he had a few figures giving approximatively the consumption for motive power. On these bases, and with the aid of the Company's accounts, he constructed the following table, showing the production and consumption of gas in Paris, in millions of cubic metres, in the five years under consideration :—

Year.	Total Production of Gas.	Consumption of Gas.				
		Public Lighting.	Private Lighting.	Cooking and Heating.	Motive Power.	Outskirts of Paris.
1855	40·8	7·2	27·6	..	..	..
1872	147·7	14·6	84·3	26·6	..	6·6
1877	191·2	16·5	105·6	42·5	0·9	10·0
1883	283·9	22·5	152·4	72·0	3·0	18·0
1889	312·2	30·1	159·9	81·8	3·5	19·9

When these figures are examined, there is one feature that cannot fail to arrest attention—viz., the increasing use of gas for cooking and heating purposes. But it is not in the kitchen only that the calorific properties of gas are appreciated. In the work-rooms of tailors, hatters, laundrymen, bookbinders, and others, its cleanliness and its facility of lighting, extinction, and regulation strongly recommend it as an auxiliary to the operations therein carried on. The consumption of gas for illuminating purposes is divided between the private and the public lighting; and therefore it is upon the totals of these two columns of the foregoing table that the following figures, showing the quantities of light produced by gas, have been arrived at :—

Year.	Population.	Quantity of Light in Decimal-Candle Hours.	Quantity of Light per Inhabitant in Decimal-Candle Hours.
1855	1,174,346	2,784,000,000	2371
1872	1,851,792	7,912,000,000	4272
1877	2,044,849	9,768,000,000	4776
1883	2,299,193	13,992,000,000	6087
1889	2,389,705	15,200,000,000	6470

Certain kinds of burners consume 14 litres—say, 0·5 cubic foot—of gas per hour to produce the light of a decimal candle; others, much more economical, yield the same amount of light with a consumption of 5·4, or even with 3 litres per hour. On an average, we may reckon upon the production of a quantity of light equal to 80 decimal-candle hours for each cubic metre of gas consumed; corresponding to 125 litres per decimal candle per hour. This average was given to M. Fontaine by several gas men; and he found it agreed with the results of a series of photometrical experiments carried out by him ten years ago, as well as with certain documents supplied to him bearing upon the subject of the ordinary and high-power burners in use in Paris. It was on this average that the preceding table was compiled. It will be seen therefrom that, notwithstanding the competition of petroleum and electricity, the quantity of light furnished by gas to each inhabitant of Paris does not diminish. Last year was necessarily an exceptional one; and consequently the 6470 decimal-candle hours given in the table must not be regarded as normal. A slight falling off in the consumption has been recorded in the early months of the present year; but M. Fontaine does not think that the figure will descend below the 6087 stated for the year 1883. It may be truly said that while the use of gas has extended considerably in the direction of the industries in which its calorific properties are of value, it still holds the position it has acquired as a lighting agent; and M. Fontaine's opinion is that it will retain this position for a very long time, if the engineers and others who control its destinies do not determine some day to transform their industry by adding to the manufacture of gas the production of electricity, with the view of keeping up their character as the greatest suppliers of light in Paris.

As already mentioned in the JOURNAL, the gas supplied by the Paris Gas Company is not the only gas consumed in Paris. There are in existence at Charonne works where "portable" gas is manufactured from Boghead coal. This gas, which has high illuminating power, is compressed to 10 or 12 atmospheres in cylindrical receptacles made of sheet iron, in which it is conveyed to the houses of the consumers, where it is transferred to other cylinders fixed upon the premises. Twenty years ago this gas was favoured in Paris to some considerable extent; but M. Fontaine was unable to procure from the proprietors of the works any statistics which he could embody in his address. At the present time the Charonne works supply a certain number of customers in the suburbs of Paris, and a few in the city itself; but the consumption of this gas has too little influence on the total lighting to be worth consideration in connection with the other illuminants. The quantity of Boghead coal imported annually into France only amounts to about 20,000 tons. Reckoning that each ton gives 325 cubic metres, or (say) 11,500 cubic feet, of gas, the total production of "portable" gas for the whole of France does not exceed 6,500,000 cubic metres; and assuming that Paris takes 10 per cent. of the entire make (which is certainly an exaggerated estimate), we obtain a very insignificant figure in comparison with the 189 million cubic metres of ordinary coal gas employed in the public and private lighting of the city. It is, therefore, sufficient to merely indicate here the existence of this source of light, without troubling to estimate its effect upon the artificial lighting of Paris.

Electricity.—We now come to the last (and probably, from his point of view, the most important) lighting agent dealt with by M. Fontaine. He tells us that electric lighting did not make its appearance until near the close of the year 1873; and it was not employed to any great extent. In 1877 there existed in Paris only 22 installations of the electric light, employing 230-horse power in its production; whereas in 1883 there were 100 installations, requiring about 900-horse power, and producing a luminous intensity estimated by M. Fontaine at 360,000 decimal candles. He reminds us that it was in Paris, in November, 1873, in the workshop of M. Gramme, that the first installation, on a really industrial scale, of electric lighting took place, by means of a continuous current dynamo and Serrin regulators. It was also in Paris, in 1877, that the Jablochkoff candle was first employed; 16 lights, distributed over a distance of about 1100 yards, being supplied by a single alternate-current gramme machine. Paris, therefore, had the honour of possessing the first public and private lighting produced by means of electric currents. Towards the end of last year, when the installations which had served for the lighting of the Champ de Mars and the Invalides during the period of the International Exhibition, were removed, a large number of works, theatres, warehouses and stores, hotels, cafés, &c., were illuminated by the electric light, utilizing motive power equal to about 17,400 horses, furnished by 322 steam-engines, 97 gas-engines, 65 engines worked by rarefied air, and 43 engines actuated by compressed air. Central stations are now in course of construction which, when completed, will add to the above figures 10,600-horse power. The projects actually on foot for extending the old stations, and those under consideration by large manufacturing firms who intend adopting the electric light, may be estimated to require 3900-horse power. Consequently, M. Fontaine thinks that in 1891 or 1892 the electric lighting in Paris will require for its production motive force equal, in round numbers, to 32,000-horse power.

It may perhaps not be uninteresting at this point to show how the power employed by the various electric lighting installations, of which the total is given above, is distributed. This is done in the following table :—

—	Installations in Operation.	Installations in Progress.	Installations Projected.	Total Horse Power.
Manufacturers	1,900	200	600	2,700
Central stations	5,325	9,100	3,000	17,425
Warehouses and stores	2,750	..	300	3,050
Railway stations	700	280	..	980
Hotels	700	..	..	700
Theatres	3,000	..	..	3,000
Monuments and public thoroughfares	1,215	800	..	2,015
Printers and booksellers	200	..	..	200
Installations with gas or air engines	924	..	..	924
Installations with steam-engines	620	200	..	820
Totals	17,424	10,580	3,900	31,904

The works actually in operation require 17,424-horse power, and produce currents which supply about 6800 arc, and 118,000 incandescent lamps. The total luminous intensity of these 124,800 burners may be estimated at 3,484,800 decimal candles, assuming that 1-horse power is equal to 200 candles; and M. Fontaine reckons that they will burn during 1460 hours per annum—giving 50,878,080,000 candle-hours. The following table shows the quantity of electric light furnished to the

entire population and per inhabitant in the years under consideration:—

Year.	Population.	Quantity of Light in Decimal-Candle Hours.	Quantity of Light per Inhabitant in Decimal-Candle Hours.
1855	1,174,346	..	..
1872	1,855,792	..	..
1877	2,044,849	134,220,000	65
1883	2,299,193	525,560,000	230
1889	2,389,705	50,878,080,000	2130

M. Fontaine is of opinion that by the end of 1892 the quantity of electric light furnished per inhabitant per annum will certainly exceed 4000 decimal-candle hours.

Summarizing the statistics contained in the preceding tables, we arrive at the following quantities of artificial light (valued in decimal-candle hours) used per inhabitant per annum in Paris:—

Year.	Candles.	Vegetable Oils.	Mineral Oils.	Gas.	Electricity.	Totals.
1855	220	1174	..	2371	..	3,765
1872	250	967	503	4272	..	5,992
1877	210	770	722	4776	65	6,543
1883	217	649	1244	6087	230	8,427
1889	190	517	1995	6470	2130	11,302

As will be seen from the above figures, Paris possesses an amount of artificial illumination corresponding to a light of 11,300 candle-hours per inhabitant per annum, or about 30 candles per inhabitant per day. Of the total lighting, 1·6 per cent. is furnished by candles, 4·5 per cent. by vegetable oil, 17·7 per cent. by petroleum, 18·9 per cent. by electricity, and 57·3 per cent. by gas.

Without wishing to speculate as to the modifications which the foregoing proportions are likely to undergo in the near future, M. Fontaine offers a few general observations on the results actually achieved and the tendencies to change which are making themselves manifest. In the first place, he points out that the lighting of Paris per head of the population is now three times as great as it was 35 years ago—the annual increase being larger since electricity has contributed its quota to the total amount of light. Next, he tells us that vegetable oil and candles furnish together only 6 per cent. of the total light; and this quantity is decreasing yearly. The three sources of light which are most employed are gas, electricity, and petroleum. The use of gas, he says, remains nearly stationary; that of petroleum increases rapidly; while electricity, although it is only just making its *début* as a general illuminant, has attained the second place. When the electrical installations which are now being carried out are finished, and their total motive force of 32,000-horse power is utilized during twelve hours of the day, the quantity of electric light per inhabitant in Paris will be equal to 11,760 decimal-candle hours; that is to say, rather more than that which is now furnished by all the other sources of artificial light combined. He thinks that electricians are justified in feeling satisfaction at the present position of their industry, and that they ought to seek not only to keep the place they have attained among the producers of light, but make vigorous efforts, wisely directed, to extend the use of electricity in both public and private establishments. Without troubling themselves about other systems of illumination and seeking to eclipse or supersede them, electricians should endeavour to ascertain what still remains to be accomplished in the way of satisfying the demand for more light. This demand increases every day; and, as remarked by M. Mascart, it will continue until the lighting by night is equal to that by day. What, he asks, would this mean in the case of Paris? The superficial area of the city is about 30 square miles, and the total quantity of solar light distributed over it per inhabitant per annum may be estimated at 116 million decimal-candle hours, or more than 10,000 times as much as the total artificial lighting at present furnished. Consequently, M. Fontaine considers he is justified in saying that the suppliers of the various kinds of artificial illuminants have something else to do than to criticize each other. The field of their future operations in Paris is, so to speak, boundless; and therefore the progress and development of one system of illumination should only stimulate the general demand for light, and help to develop all other systems which are really practical.

Railway Rates for Merchandise.—The Board of Trade have presented to Parliament several reports, made under the terms of section 24 of the Railway and Canal Traffic Act, 1888, on the classification of merchandise traffic and the schedule of maximum rates applicable thereto. The reports apply to the South-Eastern, London and Brighton, London and South-Western, Great Western, London and North-Western, and Great-Northern Railway Companies. With all these Companies the Board of Trade have been unable to come to an agreement; and, it is understood, that they will employ the time before next session in considering any facts and figures which may be submitted to them, before embodying in a Provisional Order the classification and schedule which they think ought to be adopted.

THE TRANSIT OF MATERIALS IN GAS-WORKS.

A Paper by Mr. Gilbert Little, of London, read at the Annual Meeting of the North British Association of Gas Managers.

Until near the end of last century, industrial progress was strangled by the impossibility of transmitting materials from one part of the country to another; and as any marked development in commerce was impossible until men could find the means of conveying commodities from the place where they were produced to the place where there were people willing to make use of them, it is not surprising, when this fact became generally apparent, that in fourteen years—from 1760 to 1773—no less than 452 Acts of Parliament were passed for the improvements of roads and highways. A few years later, the same desire to improve the methods of transferring goods and manufactures created in Great Britain a passion, which quickly passed into a species of mania, for the formation of canals; and before the century closed, the country was provided with such a length of water carriage-way that commerce was no longer entirely repressed by the difficulty of conveying goods, and a vast expansion of trade was the result. The expansion of manufactures which followed improved roads and canals again called for the more easy and speedy transit of men and materials. The steam-engine was the agency by which it was to be supplied on both sea and land; and that free personal intercourse which is so essential in the conduct of business enterprise was made possible by the splendid conceptions of steam locomotion and steam navigation. A fresh impetus to improving our modes of transit is again apparent; and the inventive and practical business minds of the country are to-day, as keenly as at any former period, glowing with the desire to improve the means of transport—abridging space by notable bridges, bringing the distant places of the earth together by swift steamers, and improving inland water-carriage by ship canals.

By less prominent, but not less valuable, labour-saving results, innumerable contrivances for shortening processes of labour and improving the modes of transit in works and factories have been introduced. An unlimited possibility of improvement has revealed itself in this direction for all our industries; and instead of seeing finality in the existing appliances, the point only is seen from which a new era of progress could take its opening, and remove the present-day debilitating restraints on trade, the chief of which is the labour problem. This problem has recently forced itself largely to the front among the members of this and kindred Associations; and the object of my paper is to invite attention to the subject of mechanical transit of materials in gas-works, by means of which the charging and discharging of the retorts and purifiers are rendered practically labourless. This can best be done by repeating shortly the *modus operandi* of the systems. I will take first Mr. Livesey's arrangement of our conveyors at the South Metropolitan Gas-Works in the Old Kent Road, London, designed for eight ranges of retorts, each about 180 feet long, by Mr. Livesey's assistant, Mr. Nixon. This arrangement deals with the coke only. The coke, as it falls from the retorts, drops through the stages on each side, all along the eight ranges, to the ground floor under the arches on to wide link-plate conveyors, which convey the coke from any point of the eight ranges or settings. These lines of conveyors collect the coke from the retorts in every part of the retort-house, and deliver it to the coke-breakers, or transport it (broken or unbroken) to the yard or stores as desired. This is, I believe, the most extensive coke-conveying system yet designed; and it would be superfluous to point out the great saving in wages that will be attained, and the extent of the laborious work obviated, by thus dispensing with the trucking and wheeling necessary under the old plan.

Having explained Mr. Livesey's system of conveyors to his eight ranges of horizontal retorts, I ask your attention to the applications of our complete methods of delivering the coal along a range of inclined retorts, and the carrying away automatically of the coke from them to the breaker, yards, or stores, as supplied to the designs of Mr. F. Morris, the Engineer of the Brentford Gas Company, London, and carried out under the supervision of his assistants, Mr. Hellard and Mr. Van Vestraut. The coal as it drops from the railway trucks is lifted by one of our double detachable steel chain elevators, which delivers it into the coal-tank fixed at the end of the retort-house, about 6 feet above the level of the inlets. The tank is provided with a special outlet, through which the coal passes to our distributing conveyor, which conveys it all along the settings to supply the charging-scoops at any point. The method of charging the retorts by means of tilting scoops was fully described in the paper read at the recent meeting of The Gas Institute at Ryde,* and is no doubt familiar to every member of this Association; so we descend from the inlets to the outlets in front, where the coke as it slides out of Coze's inclined retorts drops into our tray conveyors fixed between the settings and the stages. The cooling spray plays on the hot coke in the conveyor as it passes along the yard, thereby obviating any steam or smell inside the retort-house. The coke is thus delivered cooled from the conveyor into the trucks.

The foregoing short description summarizes the complete mechanical manipulation of the coal from the time it is emptied

* See *ante*, p. 74.

from the railway trucks until it is delivered as cooled coke into trucks again; the whole process forming a complete automatic system of transmitting and distributing the materials in the retort-house.

Having described the application of our conveyor system to three double settings of inclined retorts in an average sized gas-works, I pass on to describe one put up for Mr. G. C. Trewby, of The Gaslight and Coke Company, at the Kensal Green Gas-Works, which will, when completed, be the most extensive conveying plant in the world. The coal is lifted from the barges by two crane elevators with grab buckets, at the rate of 80 tons per hour, and dropped on to two self-cleaning screens. The siftings, which form about 90 per cent. of the 80 tons of coal per hour dealt with, pass down the conducting shoots into one of our largest-sized tray conveyors; and the tailings or lumpy pieces which pass over the screens drop into the coal-breaker and thence to the conveyor. The tray conveyor carries the 80 tons per hour under the roadway a distance of 35 feet, and delivers it into one of our largest-sized detachable steel chain elevators, which lifts it above the level of the settings to a dividing hopper, from which 30 tons per hour fall direct into a large conveyor, which distributes the coal along a double setting of inclined retorts, upwards of 400 feet in length, and containing about 500 retorts. The remaining 50 tons is distributed from the hopper into two conveyors, which extend along each side of the retort-house, and distribute the coal into 38 coal-stores, each 30 ft. by 21 ft. by 18 ft., for the night supply or reserve stock. This completes our system of taking the 80 tons of coal per hour from the barges direct to 500 retorts and 38 stores during the day of nine hours. For the night service, the coal is drawn from the coal-stores into conveyors (fixed underneath in arches), which deliver it into the elevators, and these in turn supply the charging-scoops. By this means, Mr. Trewby has provided his Company with the greatest labour-saving conveying plant ever designed; and we are carrying out the work under the supervision and to the approval of Mr. M'Minn, the Resident Engineer at the Kensal Green works.

And now, in a word, permit me to describe our system of conveyors to automatically distribute the oxide of iron or lime in the purifiers; the arrangement selected for description being that of Mr. F. L. Ramsden, the Engineer and Manager of the Corporation Gas-Works, Burton-on-Trent. In the centre of the revivifying house, we fix a conveyor, the top of which is flush with the floor. This conveyor carries the oxide of iron from any point along the floor to an elevator, which lifts it to another conveyor fixed above, and extending over the purifiers, to distribute the oxide into each by means of swivel shoots provided with shut-off doors to regulate the supply to each or all of the purifiers as desired. Our arrangements for delivering the lime into the purifiers are similar; but for lime we use a different design of conveyor, to prevent clogging.

Our patent system for feeding the coal into the mechanical stokers on ranges of steam-boilers is also very similar to our systems of automatically feeding retorts and purifiers, except that we use our spiral conveyor in eccentric-shaped troughs.

I have now put before you our different labour-saving systems for transmitting materials, which we believe, if generally adopted, would do much to equip you in the struggle for success which constitutes competition. The history of gas making is a record of progress. Each generation of engineers and managers has passed on to the next the wisdom which they inherited, modified by their own experience, enlarged by the addition of their own discoveries and improvements. But the last few years have witnessed progress beyond all precedent; and if the special apparatus described in this paper should help to remove or lessen the cost of conveying materials in gas-works, the Directors and Engineers of the New Conveyor Company will be rewarded at any rate with a feeling of satisfaction in having contributed something to attenuate the difficulties of the labour question.

Mr. John Sledden, who was formerly Manager of the Haslingden Union Gas-Works, died on Saturday, the 30th ult., at the age of 72 years. Mr. Sledden occupied the position of Manager for about 20 years, and retired from it some time ago.

Eastern Counties Gas Managers' Association.—The fourth general meeting of this Association will be held, under the presidency of Mr. John Barton, of Peterborough, at Yarmouth, to-morrow week. The members will assemble at the Town Hall at eleven a.m., when some formal business will be transacted, and two papers read. In one Mr. James Lees will tell the members how to maintain and increase the popularity of gas; and in the other, Mr. J. E. Buckle will deal with general matters connected with the working of gas-works. At half-past one the members will adjourn for luncheon; and the remainder of the day will be devoted to pleasure. There will be a coach drive to the works of the Great Yarmouth Gas Company and of the Gorleston and Southtown Gas Company. The members will afterwards visit the seat of Sir Saville Crossley, Bart., M.P., of Somerleyton, who has kindly given permission to view his gardens. Early in the evening, dinner will be served at the Duke's Head Hotel at Yarmouth. With this programme and propitious weather, a pleasant day should be spent at this popular seaside resort.

REGISTER OF PATENTS.

Improving the Illuminating Power of Lighthouses and other Places.—Wigham, J. R., of Dublin. No. 14,990; Sept. 23, 1889. [6d.]

In patent No. 6195 of 1882 there was described an arrangement for increasing the illuminating power of lighthouses, consisting of superposed lighthouse lenses placed in pairs side by side in the same plane with lamps or burners in the focus of each; and the present invention by the same patentee relates to an arrangement by which lighthouse lenses are so placed, whether superposed or otherwise, with regard to each other that by the use of two lights instead of one a beam of double the ordinary intensity is produced and received by the observer at shorter intervals at a given speed than can be obtained from the arrangement described in the former patent. The lenses for the juxtaposed lights, whether for one pair of lights or for any number of pairs which may be used superposed, are placed diagonally or rectangularly to each other, so as to make, instead of a two-faced apparatus, as described in the earlier specification, an apparatus with several faces in accordance with the figures required—whether square, hexagon, octagon, &c.; and by this means groups of flashes of precise optical duration and recurrence are produced, or alternate periods of light and darkness. The arrangement of mirrors (dioptric or otherwise) for throwing back the light and heat on the focal burners described in the former patent, may also be applied in connection with this arrangement where advisable.

Lock Stopcock for Gas and Water Supply.—Ashton, J., Wormald, A. H., and Ashton, A., of Oldham. No. 15,211; Sept. 27, 1889. [6d.]

The objects of this invention are: (1) To prevent the consumption of gas or water without the knowledge and consent of the vendor; and (2) to render it unnecessary to disconnect the service-pipe from the meter when a purchaser ceases to take a supply.

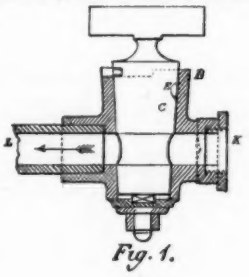


Fig. 1.

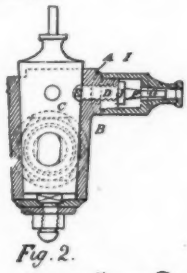


Fig. 2.

Fig. 3.

Upon the barrel B, enclosing the plug C, there is cast the pap A, which is drilled and tapped to receive the screw D. The plug is countersunk at E to receive the point of the screw, when it is screwed down to lock the plug in the position in which it is when the gas or water is shut off. The middle part of the screw has on it a circular collar J, forming the base of a triangular pyramid F, the sides of which are cut short at the apex, so as to form rectangular stops to prevent the blades of the key H (fig. 3), sliding up the angles of the pyramid when it is inserted for the purpose of locking or unlocking the tap. The part G of the screw is a parallel spindle, forming the guide to the key. The outer circumference of the pap A is tapped to receive the cover I, which is screwed on and pinned fast before the stopcock is fixed to the service-pipe. The inner portion of the cover is parallel, to allow the collar J to be moved sufficiently to withdraw the point of the screw from the plug at E, but not from the barrel B. The outer part of the opening in the cover I is only just large enough to admit the key when its blades are slightly compressed. The opening widens or tapers inside sufficiently to admit the upper portion of the pyramid before described; but that portion of the pyramid is made too large to enter the outer opening. The key has three flat blades made of sufficient length to grip the sides of the pyramid, and of a strength sufficient to work the screw D in locking or unlocking.

The objects sought to be obtained by this construction of the lock and key are to make it difficult for anyone who has not seen the key or the interior of the lock to discover a means of unlocking it, as no key that is not split and that will enter the opening in the cover I can grip the sides of the pyramid; also to effect these objects without adding greatly to the bulk or cost of the stopcock now in use.

Fig. 1 shows how the meter can be attached to the service-pipe, so as to prevent any surreptitious detaching of it for the purpose of obtaining an unregistered supply of gas or water. The part K represents the screw by which the stopcock is screwed on the iron service-pipe. The part L shows the outlet end of the stopcock cupped, and tinned inside the cup to receive one end of the lead pipe which connects the service to the meter.

Charging and Drawing Gas-Retorts.—Somerville, J., of the South Metropolitan Gas-Works, Bankside, and Cutler, S., of Millwall. No. 15,409; Oct. 1, 1889. [8d.]

This invention has for its object the construction of apparatus whereby the reduction of manual labour, and the more expeditious and convenient charging and drawing of gas-retorts, may be effected.

Fig. 1 is a side elevation of the frame for carrying the scoops, the framework of one of which is seen supported by the lower line of rollers, while the scoop on the middle tier is drawn complete. Fig. 2 is a front elevation of fig. 1; but in this view neither of the scoops is shown complete. Fig. 3 is a front end view of the scoop, drawn to a larger scale. Fig. 4 is a transverse sectional elevation of it. Fig. 5 is a plan of the front end of the scoop and the levers for actuating it. Fig. 6 is a longitudinal elevation of the rake in position for thrusting into the retort. Fig. 7 shows it in position for withdrawing the coke.

Fig. 1.

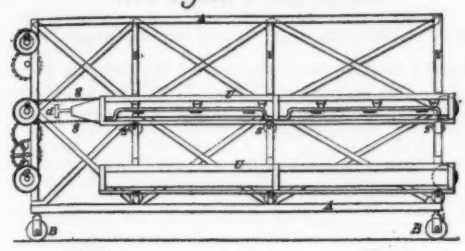


Fig. 2.

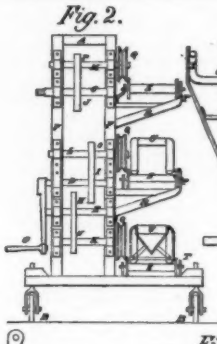


Fig. 5.

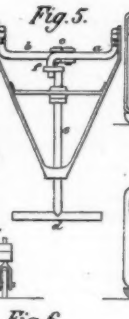


Fig. 3.

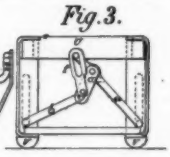


Fig. 4.

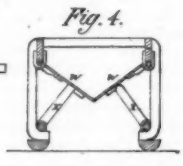


Fig. 6.

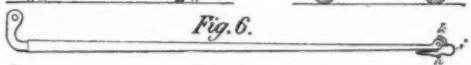
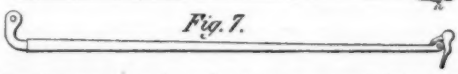


Fig. 7.



The charging apparatus is made of a strong quadrilateral frame A, both in longitudinal and transverse section, mounted upon wheels B. At the front end of the frame, three or more horizontal shafts C, D, and E are mounted in bearings fixed to the uprights F of the frame; one end of each shaft being squared so as to be turned with a winch-handle G having a long socket. Each of these shafts carries a spur-wheel H, I, J. Three other horizontal shafts K, L, M are also mounted in bearings similar to those just mentioned, each carrying a pinion (respectively N, O, and P), which gears into its corresponding spur-wheel. At one end of each of these latter shafts, a chain-pulley Q is keyed. Upon the lower part of the end of the frame, and upon brackets R placed a little below each chain wheel, horizontal rollers S are mounted in short standards T, rising from the brackets R. A similar set of rollers is mounted at the other end of the frame; and there are also intermediate rollers, all of which serve to bear the scoop to be presently described. At the back end of the frame, next to the retorts, and at or about the height of each retort mouthpiece, a bridge-piece is pivoted, and so arranged as to be adjustable to the exact height, and admit of its entering the mouthpiece.

The scoop U is made with a framework, the lower part of which V is shod with half-round iron. The end nearest the operator is closed, while the other end (nearest the retort) is open. On the upper part of the frame the two sides W, of sheet iron or steel, are hinged; and when brought together, their lower edges (which are bent as shown in fig. 4) meet, and form the coal-holding V-shaped trough constituting the scoop. Pivoted to the frame there is on each side a long rod or bar X, cranked at intervals, and bent at right angles to its length at its front end, as in fig. 5. The bent end of each rod forms an arm *a* and *b*, which are connected together by a toggel-joint *c*, and are operated upon by the handle *d* (fig. 5) and rod *e*, which terminates in a short slotted arm *f* pivoted to the extremity of *a*. Upon turning the handle *d* in one direction, the sides of the scoops will be closed together; while by operating in the reverse direction, they may be instantly opened, and caused to fall against the sides of the frame. The front end of the scoop has fixed to it the ends of a chain *g* that passes round each pair of chain-wheels borne by the frame, and by the aid of which the scoop is drawn into or out of the retort. The scoops when placed in position on the rollers of the frame may be filled with coal either by hand or by bringing them against a hopper furnished with revolving valves, or a sliding shutter arrangement, whereby a certain regulated quantity of coal may fall into the scoop.

The mode of using the machine for each scoop is as follows: The scoop having been filled with coal, the machine is brought in front of the retort to be charged. The bridge-piece is then adjusted; and upon turning the winch-handle, the pulleys revolve, and cause the chain to draw the scoop into the retort. When the scoop has reached its extremity, the scoop-handle is actuated by the attendant, when the sides of the scoop diverge, and the coal falls on to the bottom of the retort. Upon reversing the motion of the winch-handle, the scoop will be drawn out into its original position, and the mouthpiece may be closed.

The drawing-machine consists of a frame similar to the charging-machine; but instead of long cylindrical rollers such as the scoop slides upon, deeply-cut sheaves or pulleys are placed to receive and support the rake-bar. The rake-head *h* (fig. 6) is hinged to the rake-bar *i*, is weighted at *j*, and is provided with a stop *k*, so that when thrust into the retort it will pass over the coke, but upon withdrawing it the head will fall and bring the coke with it. The manner of actuating the rake is precisely similar to that of the scoop.

Gas-Engines.—Green, W. H., of Northampton. No. 16,202; Oct. 15, 1889. [8d.]

This invention relates to an engine having a cylinder with two slide-valves, one on the front and one at the side, contained in boxes after the manner of an ordinary steam-pump. The side valve supplies air and exhaust products of combustion; while through the front valve is received gas and air, and the means for igniting the mixture passing through a hole in the centre into the explosion-box at the foot of the cylinder. In the interior of this box is arranged a self-acting clack-valve, by means of which "back explosions" are prevented, while the hole in the outer valve or plunger is being closed. The valve or plunger at the side of the cylinder exhausts the products while at the same time air is drawn in through perforations in the top of the valve, and down the centre of it, by means of a disc or crank on the end of the fly-wheel shaft; the plunger being arranged so as to descend only so far as to supply sufficient air, and then ascending withdraws the products through the exhaust-pipe. The ignition port is arranged at the foot of the cylinder; and through it the light is drawn—the self-acting clack-valve being quickly closed. Governors to regulate the admission of gas are worked by means of a catch on the top of the ignition plunger. The engine is started by turning the fly-wheel so as to bring the piston to its central position (thus introducing the necessary charge of air and gas), when the ignition takes place, and the engine continues in motion until stopped by turning off the gas.

Water-Waste Preventers.—Streeter, F. S. of Hackney. No. 6406; April 26, 1890. [6d.]

This invention consists in operating the delivery-valve controlling the delivery of water to (say) a closet through the medium of a sort of "dash-pot" or hydraulic connection, whereby the closing of the delivery-valve is independent of the pull-handle, and is regulated only by the flow of water through a contracted passage, so that the valve will close automatically in a predetermined time sufficient for the flushing of the closet, and so cut off the delivery, notwithstanding that the handle may not be released. The valve and handle are respectively connected to a cylinder and to a piston working loosely therein; the cylinder acting as a piston in an outer vertical cylinder placed in the cistern over the delivery-valve seat, while the inner cylinder is closed at one end so that upon the piston being raised the inner cylinder and delivery-valve will be raised also, owing to the difference of pressure within and outside the moveable cylinder. The fixed cylinder is closed at the bottom, and provided with an inwardly opening check-valve to admit water beneath the moveable cylinder when the latter is raised to open the delivery-valve, and prevent its escape otherwise than as hereafter described when the valve is closing. The valve having been opened at once, commences to close by gravity at a speed dependent on the escape of water either between the moveable and fixed cylinders (if the pull-handle be at once released) or both between those cylinders and also between the piston and moveable cylinder, if the pull-handle be retained.

Manufacture of Illuminating Gas.—Pitt, S.; communicated from E. J. Jerzmanowski, of New York. No. 9733; June 23, 1890. [6d.]

This invention relates to the adding of an illuminant to gas, which is ordinarily done in what is known as a fixing-retort—an externally-heated chamber, generally longitudinally arranged; and the naphtha passes together with such gas through the fixing-retort. The difficulty in connection with this process, says the patentee, is that the illuminant comes in contact with surfaces cooled by the incoming gas; and therefore is likely to deposit, besides being less thoroughly vaporized. By the present improvement, the illuminant comes into the retort at the end opposite from that into which the gas is flowing, thereby becoming thoroughly vaporized by the high heat there; the gas itself being in a hotter condition, and therefore more ready to receive and assimilate the illuminant.

Fig. 1.

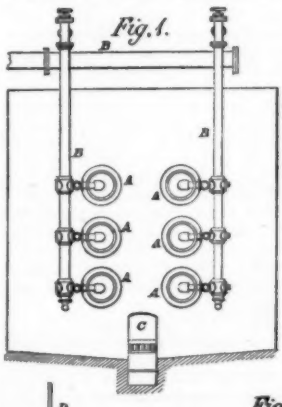


Fig. 2.

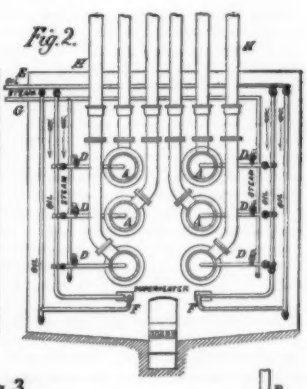


Fig. 3

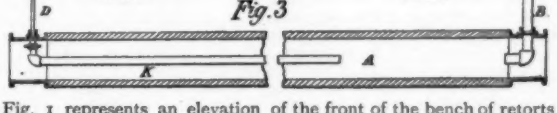


Fig. 1 represents an elevation of the front of the bench of retorts; and fig. 2, the rear. Fig. 3 is a vertical section through one of the retorts.

A are the retorts; and B, the pipes conveying the already manufactured gas to the receiving end of the retorts, which are heated beneath by the furnace C. The oil of hydrocarbon to be volatilized is introduced at the discharge end of the retort by the pipe D, which communicates by suitable valves and connections with the general oil-supply pipe E. The connections are such that the oil may be heated by passing through the walls of the bench before entering the retorts; or it may be conducted directly into the retorts, if desired. Superheating contrivances are shown at F—of any ordinary construction. The pipe G communicates with live steam, and may likewise be caused to communicate with the pipe D by suitable valves. The finished gas escapes by the pipes H to the hydraulic main in the usual way.

The operation of the apparatus is as follows: The retort being brought to a suitable heat, the oil is introduced through the pipes D; and thence, through the retort-pipe K, it escapes into the interior of the retort at a point by preference about two-thirds of the length of the retort from its point of entrance. The pipe K serves as a retort to heat the oil before its escape. The vaporized oil then returns back upon its course, together with the gas, and escapes by delivery-pipes. In this way the problem of using low-grade illuminating oils (as, for instance, crude oil) is said to be solved; these oils having hitherto been very difficult of utilization, causing considerable deposit. In case the retort should be so hot as to endanger a deposit of lamp-black, a sufficient amount of steam can be caused to enter the oil-supply pipes preliminarily to chill them to the required temperature; and the steam is likewise useful in keeping the pipes clear, in case they should have a tendency to choke up.

APPLICATIONS FOR LETTERS PATENT.

12,935.—Hulseberg, C., "An improved gas-lamp." Aug. 18.

13,019.—Vermand, P. J., "Improvements relating to gas-engines." Aug. 19.

13,084.—Cario, C. J., "Improvements in pyrometers." Aug. 20.

13,091.—Cole, A. F., "Improvements in gas regulators or governors." Aug. 20.

13,140.—Tylor, J. J., "Improvements in liquid-meters." Aug. 21.

13,158.—Zimmermann, E., "Improvements in or relating to the manufacture of pipes, tubes, or the like." Aug. 21.

13,186.—Froggatt, W., and Dawson, G., "Improvements in the construction of steam generators and gas coolers." Aug. 21.

13,326.—Milnes, J., "Improvements in or relating to the manufacture of water service-pipes." Aug. 25.

13,352.—Ovens, W. and T. C., "Improvements in gas-engines." Aug. 25.

13,382.—Welch, W., "Improvements in purifying coal and water gas and other inflammable vapours." Aug. 26.

13,390.—Batten, J., "Improvements in or relating to regenerating furnaces." Aug. 26.

13,398.—Nevill, W. H., "Improvements in the treatment of coal tar and pitch." Aug. 26.

13,431.—Moat, G., "Improvements in apparatus for testing gas or air mains." Aug. 26.

13,480.—Lea, R. H., Cooper, E. W., and Brett, W. J., "Improvements in gas and vapour engines." Aug. 27.

13,499.—Jones, F. J., "Improvements in the manufacture of coke, and in purifiers for use therein, and in gas manufacture." Aug. 27.

13,574.—Thwaite, B. H., "Improvements in methods of producing combustible gases for heat and lighting purposes, and in apparatus therefor." Aug. 29.

13,588.—Abrahams, G. E., "A meter for measuring compressed air or any other gas; also water or any other fluid." Aug. 29.

13,592.—Jackson, J., "Improvements in or connected with gas-fired steam generators." Aug. 29.

13,594.—Offen, G. C., "Improvements in gas or other explosive engines." Aug. 29.

13,622.—Greene, T. A., and Walker, C. M., "Improvements in gas regulators." Aug. 29.

13,652.—Suiter, A., "Improvements in regulators for high-pressure gas." Aug. 30.

13,664.—Greenwood, H., "Improvements in or applicable to gas-burners." Aug. 30.

13,681.—Leemann, J., and Baumgartner, L., "New or improved apparatus for illuminating and heating by petroleum." Aug. 30.

The Water Supply to Brewers at Preston.—In moving the confirmation of the minutes of the Water Committee at the last meeting of the Preston Town Council, Alderman Maynard stated that they had decided that meters should be obtained, and placed in all public-houses in the town where brewing was carried on, at an estimated cost of £4500. The brewers, he said, used water not only for the purpose of making beer, but also for the purpose of cooling it. The Committee had no check upon them; and they thought it was desirable that meters should be placed on their premises, so that they could tell how much they used. In winter they had sufficient water to allow some of it to be wasted. But there were times when they were somewhat pinched; and they thought by making this class of people pay for what they used, they would save some. The number of meters required—324—seemed a large one; but he pointed out that they would receive a rental of £268 12s. for them, which would go a good way towards paying their cost. The motion was adopted.

Collapse of a Reservoir at Castleford.—For many years the Local Board of Castleford have been labouring under difficulties of one kind or another, which have greatly retarded works of sanitation and public improvement generally. Now, when they are on the eve of completing a water scheme which it was hoped would relieve the town of anxiety for a long time to come, they have been overtaken by the collapse of their water reservoir. Unfortunately the site of the reservoir was not happily chosen. As a matter of fact the substratum within a comparatively short distance of the bottom of the reservoir is largely composed of loose sand and sandstone, of which not a little, from one cause or another, has been removed. At last a collapse has taken place, and the reservoir has been suddenly emptied. Investigation led to the discovery of a large cavity in the bottom of the reservoir through which the water has disappeared; and as no flooding of the adjacent parts took place, it is surmised that there must be cavities of enormous dimensions beneath the reservoir, or that the water may have found its way into some of the disused colliery workings of the neighbourhood. A special meeting of the Local Board was at once called, and steps were taken to find out the extent of the damage and the best method of repairing it. For the time being the mains have been connected with the pumping apparatus, so that water is being supplied direct, in lieu of that from the reservoir. The Board are fortunate in that they are receiving also a partial supply (while their new pipes are being laid to connect with the Wakefield mains at Whitwood) through the main of the Whitwood Local Board.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Mr. Gadd's Gas Institute Paper and Mr. Cripps's Criticism.

Sir,—I am glad your correspondent "C. E.," whose letter appeared in the Journal for Aug. 26, has alluded to the second paragraph of Mr. Gadd's letter in the preceding issue, not merely because it is a gross misrepresentation of Mr. Cripps's views, as set forth in his criticism and subsequent letters, but because it directs attention to the most important point in Mr. Gadd's paper—viz., the mathematical determination of the vertical pressure upon the spiral guides. Either Mr. Gadd or Mr. Cripps must be wrong in the matter, as one states the strain to be five times as much as the other, under the same conditions of wind pressure.

I gather from Mr. Gadd's paper that the maximum strain coming on any one guide is, for the gasholder under consideration, 1250 lbs., due to a 50-lb. wind pressure. On the other hand, Mr. Cripps has stated that, for this same pressure of wind, the vertical forces induced on the structure would, if properly distributed over the guide-rails, produce a force of not less than 6666 lbs. on the most-severely strained one. As I was anxious to discover the truth of the matter, I calculated the strains *exactly*, as far as it is possible to do so in cases of this kind, with the result that the pressure on the most severely-strained guide would be no less than 10,000 lbs. under the very best conditions. Even without taking into consideration the effect of the unequal distribution of snow on the top of the holder, and without making any allowance whatever for wedge action, elasticity of structure, and tendency to local distortion.

It should be noted that this 10,000 lbs. is only the proper share of the vertical pressure brought to bear upon the most severely-strained guide—*i.e.*, the one farthest from the neutral axis. The other guides have each their own proportion of the load to bear, which would be less as they approach the neutral axis of the system. Of course, we need not trouble about these latter, as they may each in turn become the most severely-strained guide (according to the direction of the wind), and must therefore be made equal to resisting the maximum.

Of course, we understood from Mr. Gadd that his paper was mathematically exact; and one cannot refrain from expressing surprise, as Mr. Cripps has done, that he has under-estimated to so alarming an extent the actual strain due to the wind pressure he gave. Mr. Cripps did not make the error appear as bad as he might have done, and presented his corrected calculations as an approximation only. Instead, therefore, of Mr. Gadd having under-estimated the strain to a five-fold extent, it is no less than one-eighth of what it ought to be; not allowing for the effects due to snow, &c., already referred to. If we take these latter into account, the direct reaction of the guide-rail upon the roller cannot possibly be less than *twelve times* as much as Mr. Gadd says it is. My figures are not given wildly or hurriedly; they are capable of mathematical demonstration. This is to be found in several well-known standard works on mechanics, without wasting time on unnecessary experiments.

Surely Mr. Cripps is to be complimented for pointing out these errors. Mr. Gadd, at least, is much indebted to him; for although the baby holder at Northwich may be sufficiently strong to resist destruction (having, for practical reasons, been made much stronger than the figures Mr. Gadd gives would lead us to suppose), yet, when he comes to proportioning the parts of *large* gasholders, if he only makes them sufficient to resist one-twelfth of the actual strains upon them, they will assuredly come to grief.

Aug. 30, 1890. Gas Engineer.

P.S.—If the wind pressure be taken as 32 lbs. per square foot—the same as in Mr. Cripps's work on "The Guide-Framing of Gasholders"—instead of 50 lbs., the maximum pressure upon any guide-rail would be 6400 lbs. (not allowing for wedge action, &c.), which is as nearly as possible the amount roughly estimated by Mr. Cripps in his criticism.

The Brin Oxygen Process and the Suppression of Effluvia from Gas-Works.

Sir,—I notice in the abstract of the paper read at the Sanitary Congress at Brighton by Mr. W. H. Collins, F.C.S., on "The Alleged Danger to Public Health arising from Effluvium Nuisance from Gas-Works," which appeared in the last number of the Journal, that the following passage occurs: "If lime is used for removing the carbonic acid alone, all is well; but when it is used for the sulphur compounds in addition, it is most offensive, for sulphuretted hydrogen and bisulphide of carbon are released, creating a disgusting and poisonous nuisance." Granting the correctness of this statement, kindly permit me to observe, that amongst the other claims of Mr. Valon for the use of free oxygen in the purification of gas, is the entire absence of smell when lime alone is employed. As you have informed your readers from time to time, lime alone has been used at Ramsgate for purification, in conjunction with free oxygen, for more than twelve months past, with an entire absence of odour. As the gas-works are in the heart of a town famous as a health resort, the public would soon have complained of any stench. These results are confirmed by the use of free oxygen and lime alone at the Shrewsbury Gas-Works since the 1st of May last; there being an absolute freedom from odour since the Brin oxygen plant has been in operation. Probably Mr. Collins was not aware of the progress that has been made with the oxygen process, nor of the satisfactory results above given.

E. B. Ellice-Clark,
Chairman, Brin's Oxygen Company, Ltd.

34, *Victoria Street, S.W., Sept.*4, 1890.

Mr. Dobbs's Charge against the Southwark and Vauxhall Water Company.

Sir,—I assume, from your sending me a copy of your issue of the 2nd inst., that you invite a reply to your article on p. 490, which comments on the printed letter forwarded to you, as the paper having the most extensive circulation among water shareholders and directors, both Metropolitan and Provincial. I thought it only fair, when calling

attention to an instance of arbitrary conduct on the part of a Water Company, that not only the general public, but those specially interested in water undertakings, should have notice of what is going on.

I do not complain of supply being cut off wherever there is a plain intention to evade payment of an admitted rate. But the circumstances of this case proved that the supply was cut off not because there was real danger of the money being lost, but because the Company preferred to take the law into their own hands. I used—and you draw attention to it—strong language with reference to their conduct. The only fault I have to find with the language is that, being vague, it merely shows that I was angry. I should have no objection to the correspondence being printed *in extenso*, and all the facts told; and comment would then become superfluous. If I were to re-write the sentence, it would be more difficult to take exception to it; but it would lose nothing in force or gravity of censure.

I regret that I have not had the pleasure of reading in your article a defence of the power of cutting off, or a statement in detail of the very weighty reasons which, as you say, there are for preferring it to a resort to a County Court. The methods of County Courts are not usually found defective in stringency.

With regard to your publication of the written words on the margin of my printed letter, I think they were obviously meant for your own eye, though I did not mark them "private." The publication is a matter of taste. I do not complain; but, as you gave your readers part, you might as well have given all.

ARCHIBALD E. DOBBS.

Dorking, Sept. 6, 1890.

The Hypothetical Tenant.

SIR,—Could you not prevail on some one of your artistic and quick-witted readers or contributors to give us a living and speaking portrait of the "hypothetical tenant" so graphically referred to by Mr. Newbigging in his last article on the "Valuation of Gas-Works for Assessment?" I think I know one Gas Engineer caricaturist, now in the land of the Danes, who is equal to the task.

T. F. H.

Sept. 3, 1890.

The Increase in the Bristol Gas Directors' Remuneration.

SIR,—As you have considered the affairs of the Bristol Gas Company sufficiently important to merit the attention of your readers on former occasions, I beg to forward for their further information the subjoined copy of a protest lodged with the Board by me against the extraordinary action of the Board at the late half-yearly meeting [see *ante*, p. 501], in forcing upon the proprietors an irregular motion for a large increase of their own remuneration, after the question had been once negatived by a vote of the meeting, and had been so ruled by the Chairman. A second protest refers to the Board's evasion of a resolution of the proprietors and of their own pledges in relation to the investigation of certain serious charges brought by me against members of the Board and of the staff.

R. W GILES,
Late a Director of the Company.

60, *Nevern Square, S.W., Sept. 1, 1890.*

[ENCLOSURE.]

Clifton, Aug. 30, 1890.

To the Board of Directors of The Bristol United Gaslight Company.

I, the undersigned, hereby repeat the protest made by me yesterday against the validity of the proceedings for increasing the remuneration of the Board, upon the ground of informality. The Chairman having moved a resolution for increasing the remuneration of the Board (now reduced to seven Directors) from £1000 to £2500 per annum, to which an amendment was proposed substituting £2100 for the aforesaid sum of £2500, which amendment was negatived by a show of hands, the original motion was put. This also was negatived by a show of hands; whereupon a count of votes was demanded by the Chairman. While the count was proceeding, the Chairman announced that the Board would admit the voting to have been adverse to the resolution, which he ruled to have been rejected, and that he would now take a vote upon a previously suggested amendment, which had been allowed to drop—that the Directors' remuneration should be increased to £2000; and he proceeded to put that question to the meeting as a new substantive resolution. Objection was taken to this course as being contrary to the recognized rule that a question which has been decided by vote cannot be reopened at the same meeting. The Chairman overruled the objection, against which ruling I made protest; declaring that I would take part in no further vote upon the subject. The great majority of those who had opposed the original resolution also abstained from voting.

I also desire to place upon record my protest against the manner in which the Board have stifled "the serious charges" which I was required, by resolution of the February meeting, "to send to the Directors in writing," with a guarantee expressed in the same resolution that they should "be fully met as matters of public importance," and for which the Board, by the mouth of their present Chairman, had "promised full investigation." Those written charges have been set aside without the pledges upon which they were furnished having been fulfilled. The *ex parte* statements of the Chairman, unsupported by evidence of any kind, as to the substance of the said charges are in every respect inaccurate.

(Signed) RICHD. W. GILES.

Stoppage of the Oxford Water Supply.—General inconvenience was felt at Oxford last Saturday week on account of the sudden cessation of the water supply about midday. Intimation had been given that, owing to some repairs being required in the distributing system, the water would be stopped at midnight on Saturday, and resumed on Monday morning. Some of the pipes were laid bare in readiness for the repairs; but the pumping of water was continued. The earth's resistance having been removed from the pipes, the force of the water caused them to be shifted; and this movement, though slight, served to loosen a joint, and the force of the water gradually burst it out. It was found necessary to stop pumping to repair the mischief; and it was not until Sunday morning that the engines were once more set to work, and then great care had to be exercised. Official notices were afterwards issued, stating that the water would be again turned off on Monday evening until Wednesday, during which time the repairs were made which it was originally intended to carry out between Saturday night and Monday morning.

MISCELLANEOUS NEWS.

NEXT YEAR'S EXAMINATIONS IN GAS MANUFACTURE.

We have received from Sir Philip Magnus, the Superintendent of Technological Examinations of the City and Guilds of London Institute for the Advancement of Technical Education, a copy of the programme of the examinations to be held next year under the auspices of the Institute. In the subject of "Gas Manufacture," the examination for which will take place on Wednesday, April 29 (Mr. Charles Hunt, M. Inst. C.E., being the Examiner), the questions to be put to the candidates will be founded on such subjects as the following:—

Ordinary Grade.

1. The construction of a retort or oven best adapted for the destructive distillation of coal. 2. The setting of retorts and the construction of retort-furnaces. 3. The effects of temperature in modifying the quantity and quality of the gas produced. 4. The description and arrangement of apparatus employed for the conveyance of the gas immediately upon its leaving the retorts. 5. The description of apparatus best adapted for condensing and cooling the gas. 6. The most suitable condition of the gas for effective purification. 7. A description of the various instruments used in gas-works for ascertaining and recording pressure and exhaust. 8. The laying of mains and service-pipes. 9. The construction of gas-meters. 10. The fixing of meters and the fitting up of premises for the supply of gas. 11. A description of the various kinds of gas-burners in general use. 12. The use of an exhauster. 13. The methods employed for controlling pressure at the works, so as to secure an adequate supply of gas at the various points of consumption, with a due regard for economical effect. 14. The simplest methods of ascertaining the purity and illuminating power of gas. 15. A description of the materials and methods employed for the purification of gas. 16. Influence of temperature and barometric pressure upon the volume of gas.

Honours Grade.

In the examination for honours, more difficult questions will be set in the above subjects; and, in addition, a knowledge will be required of: 1. The characteristic properties of the various kinds of coal, and their value for gas-making purposes. 2. The effects of temperature upon the production of residuals. 3. The chemical composition of coal gas. 4. The chemistry of purification. 5. A description of the various tests employed for determining the values of ammoniacal liquor and spent oxide. 6. Quantitative tests for impurities. 7. The development of illuminating power. 8. The practice of photometry. 9. Labour-saving appliances in the retort-house, and the working of retorts. 10. The construction of gasholders, purifiers, and other gas apparatus. 11. The principles of combustion, and their application to the working of retort-furnaces.

A provisional certificate will be granted on the results of the above examination. For the full technological certificate in the Ordinary Grade, the candidate who is not otherwise qualified will also be required to have passed the Science and Art Department's Examination in the elementary stage at least, and for the full certificate in the Honours Grade, in the advanced stage at least, in two of the following science subjects: Machine construction and drawing, applied mechanics, light and heat, inorganic chemistry, organic chemistry, geology, metallurgy, and steam.

Among the books of reference recommended to the candidate are "King's Treatise on Coal Gas," Newbigging's "Gas Manager's Handbook," Dibdin's "Practical Photometry," Cripps's "Guide-Framing of Gasholders," Hartley's "Gas Analyst's Manual," Wanklyn's "Gas Engineer's Chemical Manual," and Thorpe's "Quantitative Analysis."

We gave in the JOURNAL for the 19th ult. (p. 406), the questions put at the last examination, for answering which three hours were allowed. Taken in connection with the particulars now furnished, intending candidates will be able to form a tolerably good estimate of the kind of paper they will have to deal with on presenting themselves for examination in either grade next year.

The programme contains the rules and regulations applicable to the examinations, a syllabus of the subjects, a list of the registered teachers therein, and the papers set last year; also, as a separate leaflet, the list of prize-winners. Any further information will be furnished on application to the City and Guilds of London Institute, Examinations Department, Exhibition Road, London, S.W.

THE MANCHESTER GAS AND WATER DEPARTMENTS.

Abstracts of Accounts.

The City Treasurer's abstracts of receipts and payments and financial statement of the City Fund and other accounts under the control of the Manchester Corporation for the year 1889-90 have been issued. From the aggregate balance-sheet, made up to March 31 last, it appears that the total liabilities of the Corporation were £7,658,356. Of this amount, £780,059 was placed against the gas-works, and £4,005,069 against the water-works; leaving all the other departments between them to contribute the remaining £2,873,227. On the other side of the account, the total amount of the city's property and assets is set down at £10,440,335. The gas-works contribute £1,570,215 to this total, and the water-works £4,848,146; and this leaves £4,021,974.

Although an abstract of the accounts of the Gas Department has been already published in the JOURNAL (*ante*, p. 99), it will not be out of place to give the Auditors' report thereon which accompanied the City Treasurer's statement, as it shows the results in a concise form. The profit and loss account, they say, exhibits a gross profit on the year's working of £37,423. This is after writing off to depreciation the sum of £32,838. Of this profit £23,517 has been transferred to the sinking fund, leaving a net profit of £13,906; but, the sum of £30,000 having been paid over to the city fund account,

a deficit is left upon the year to the amount of £16,093, which sum, added to the adverse balance on March 31, 1889—viz., £10,183—leaves the adverse balance at the sum of £26,277. The direct cost of the strike which occurred during the year appears at £8521; but the indirect loss, which cannot be identified in precise figures, would reach a still larger sum. They observe that a reduction of 2d. per 1000 cubic feet in the price of gas to consumers took effect at the beginning of July, 1889. Bonds have been repaid during the year to the amount of £28,670.

With regard to the Water Department, the Auditors report that the profit and loss account shows a surplus on the year's working of £9615, which, added to the surplus on March 31, 1889, gives a total surplus to carry forward on March 31 last of £16,779. The sum of £5527 has been provided on account of sinking fund against loans under the Thirlmere Act, and £36,747 on account of borrowings under former Acts; making a total of £42,273. This year is the first that a sinking fund has to be provided on account of the Thirlmere Act. The cost of the Thirlmere works, which appeared in the last accounts at £931,633, has been augmented during the year by the further net expenditure of £340,920; making a total of £1,272,553. Bonds have been repaid to the amount of £61,300.

LEEDS CORPORATION GAS SUPPLY.

The Cost of the Recent Lock-out—Another Dispute with the Men.

At the Meeting of the Leeds County Council last Wednesday—the Mayor (Mr. Alderman Emsley) presiding— Mr. Carter moved the following resolution: "That a return be presented at the next meeting of the Council of the whole of the cost incurred by the Corporation in connection with the recent dispute with the gas workers, including expenses in regard to the new workmen employed and of extra police and military." He observed that he moved the resolution in the interests of the public. The public had to "pay the piper," though they did not choose the tune; and they had a right to know what they had to pay. In the future they would have to elect their representatives for the Council; and they ought to have information as to who voted in favour of the Committee and who did not. Mr. Teale seconded the resolution, and Mr. Harland supported it. The Council and the public, he said, were entitled to this return; and if the Chairman of the Gas Committee or the members objected to it, they took a very false position indeed, and one which could not be maintained. Alderman Gilston said that Mr. Teale was in possession of nineteen-twentieths of all the facts that were laid before the Gas Committee at its last meeting. Mr. Teale denied this; but Alderman Gilston asserted that what he said was correct. Every scheduled account was laid before the meeting and passed, with one exception. It would have been well, before gentlemen proposed, seconded, and supported a resolution, that they should know the business of the Council. They asked the Gas Committee to supply a return of the cost of the military. They knew that neither the police nor the military were under the control of the Gas Committee. The Mayor pointed out that the resolution did not say the Gas Committee were to provide this information; the Borough Accountant would do it. Alderman Gilston said the public should have a complete return before there was another meeting of the Council. He would take care that the ratepayers knew what they had to pay, and who was the cause of their paying it. Mr. Henry said he had no objection to the resolution, only it did not go far enough. What they wanted was that the whole of the matters in dispute should be placed in the report—what the Gas Committee were fighting against, and what were the advantages they obtained. The Committee were not responsible for the lawlessness. They could have filled the gas-works three times over with Leeds men. He moved the following *addendum* to the resolution: "That, in addition to the cost of the strike, the whole cost of the demands of the men be given, and also the estimated benefits of the new terms under which the men are working." Mr. Carter declined to accept this; but after some further discussion, it was put as an amendment, and was carried. The resolution, with the *addendum*, was then put to the vote, and was carried by 34 votes to 8.

In moving approval of the minutes of the Gas Committee, Alderman Gilston said that on the previous day he had seen a paragraph in a newspaper about another dispute at the gas-works. On the 21st of August, a letter was received from the Secretary of the Gas Workers' Union, and this resolution was passed: "That a copy of Mr. Cockayne's letter and the Chairman's letter in reply, together with a copy of the rules, be forwarded to Mr. Beckworth and Colonel Harding; that their opinion be asked on the subject of Mr. Cockayne's letter; and that Mr. Cockayne be informed of the steps taken by the Committee." He (Alderman Gilston) believed this was done on Aug. 22 or 23, but he had not yet heard what was the opinion of those gentlemen. The Committee, however, would be guided by that opinion when it was expressed.

The following is the paragraph alluded to by Alderman Gilston: A dispute has arisen between the stokers employed at the Leeds Corporation Gas-Works and the Gas Committee, with reference to the terms of the settlement entered into between the parties as a result of the recent lock-out. The men say that one of the conditions of the settlement was that they should forego the demand which had been made for a week's holiday in each year for the firemen and stokers. In place of this demand, the Committee were said to have promised to allow full pay for each of the Bank holidays to every man employed in the works who was not required to work, and double pay to those who were working. The men now say that the Committee have violated the agreement, and have refused to pay those men who did not work on the last Bank holiday. The men have called in the mediation of Colonel Harding and Mr. Beckworth, who acted as conciliators in the recent dispute. Work has been continued as usual, pending the decision of the mediators, which has not up to the present been made known.

LANCASTER CORPORATION GAS AND WATER SUPPLY.

The Gas Manager's Annual Report—The Accounts of the Water Department.

At the Quarterly Meeting of the Lancaster Town Council last Wednesday week—the MAYOR (Mr. Alderman Preston) presiding—the report of the Gas Manager (Mr. C. Armitage) for the year ending June 30 last, and that of the Borough Accountant (Mr. J. Hatch) on the finances of the Water Department for the same period were presented. Some figures from Mr. Armitage's statement were given in our last issue (p. 504).

Alderman HATCH, in moving the confirmation of the minutes of the Gas Committee, said he had to congratulate the Council upon the prosperous state of the gas undertaking. As would be seen by the report, they had a balance in hand of £2351; but he might say at once that they had exceeded their renewal account by £1935. At the present time they had paid out of that amount £2000 on account of a new gasholder; and had also expended a large sum on new mains, which were now being laid. He therefore thought the Committee were acting wisely in recommending the Council to hand over the balance of £2351 to the renewal fund. Not only had they overdrawn the renewal fund by £1935, but they had still to pay a good round sum on account of the gasholder—something like £6000; and likewise about £2000 on the new gas-mains. It was true they had an unused capital of £8800; but they did not propose at the present time to touch it, but to let it remain intact. They had also purchased a quantity of land, for which they expected to be called on shortly to pay a sum of £5000; so that it would be unwise to appropriate the surplus in any other way than that suggested by the Committee. At the time of the transfer of the gas-works to the Council in 1880, they made about 50 million cubic feet of gas in the year; whereas last year they manufactured 112 million cubic feet. Whilst many companies were increasing the price of gas consequent on the rise of coal, the Committee hoped to hold their own, and keep to the existing charge.

Alderman WATSON, in seconding the motion, said he ought to remind the Council that, in consequence of the high price of coal during the coming year, they did not expect to make the large profits which they had hitherto done, as the increase in cost of coal alone would amount to between £800 and £1000. The Committee were still much in debt; and he considered it a wise course to place the balance to a renewal fund.

Mr. KITCHEN pointed out that last year a balance of £1773 was handed to the renewal fund; and yet they had overdrawn that account by £1935. He considered it was about time the Gas Committee "put their house in order;" and said he would be glad could they see their way to taking over the lighting of the town, and doing it at a lower rate than at the present time. The gas-works were purchased with the ratepayers' money, and for the benefit of the ratepayers; but the gas consumers obtained all the benefit. A certain proportion of the revenue derived from the Water Department was handed over at various times to the borough fund; but the gas-works had contributed nothing beyond a sum of £500 since they had become the property of the Corporation.

Alderman HATCH said if they took money out of the Committee's reserve and handed it over to the borough fund, it might benefit a few cottage owners; but their object was to benefit the cottage occupiers who consumed gas, and not to allow them to pay a penny more in proportion than the largest consumers. In times past the largest consumers were allowed a considerable amount of discount; but the Committee considered the smaller consumers should be placed on the same footing. If the Committee could see their way to reducing the price of gas, the Lighting Committee should have the first consideration; but he could not hold out any hope that this would be the case for some time to come.

Mr. BELL said he wished to call attention to the extraordinary way in which the gas accounts were presented. Mr. Hatch said they had made a profit of £2351; but he (Mr. Bell) contended it was £4286, because, as he told them, they had spent out of revenue £1935, which made a net profit of £4286.

Alderman HATCH remarked that it was the wish of the Council, and also of the Committee, that they should not add to capital.

Mr. MOLYNEUX said he could not understand on what business principles they could advocate the disposal of the gas profits in any other way than that suggested by the Committee; and it was preposterous to mention that they should allocate the rate indirectly for the relief of those who were not gas consumers. The Gas Committee within the last few years had produced results which ought to be an example to other committees to try and do likewise. Nothing had been added to capital since 1883; everything having been paid out of revenue.

Mr. BRASH said there had been some talk about the poor ratepayer who did not consume any gas. They must remember that that ratepayer did not contribute one penny to the redemption fund; and in course of time the gas consumers would really have purchased the property. He also mentioned that last year 300 new customers were obtained.

The minutes were then confirmed.

The Borough Accountant's report on the accounts of the Water Department stated that the net profits for the year amounted to £995, as against £1105 in the previous year; being a decrease of £109. The receipts from the sale of water amounted to £8671, as compared with £8429 in the preceding year; being an increase of £242. There had been a considerable increase in expenditure for maintenance of works, extension of mains, and interest on capital debt. The sum of £2068 had been expended during the year on account of the contract for laying a new main from Brow Top to the service reservoir at Golgotha. This expenditure, it was suggested, should be met by obtaining further borrowing powers, or by defraying the cost out of the renewal fund account. It was also stated that the borrowing powers obtained under the Provisional Order of 1886 had been exceeded by £413; and application should now be made for power to borrow this amount, together with the additional sum required for the completion of the Damas Gill reservoir.

Mr. HUNTINGTON, in moving the confirmation of the minutes of the Committee, said they were not in a good position in regard to having money to spend, although the renewals to some extent were part of the water-works scheme. He did not see any use in their collecting water and storing it at Damas Gill if they could not bring it to the town; and instead of taking up pipes that were furred and filled with the accumulations of years, the Committee had thought it better to lay a duplicate line of pipes of 15 inches diameter from Brow Top to the town. It was only fair and reasonable that a considerable portion of this should be charged to capital account; and they had spent some of the renewal fund on that work. They were told in 1875 that the total cost of the water-works would be from £45,000 to £46,000; and the Corporation obtained powers in an Act of Parliament to borrow £50,000 to cover the expenditure. In 1880 they were granted powers to borrow £15,000. But still the spending of money continued; and they obtained a Provisional Order for £10,000, which brought the borrowing powers up to £75,000. The Borough Accountant informed him that up to June 30, £413 more had been spent than they had power to borrow, which made their total liability £82,100. They would, therefore, want in round figures to provide £100,000, instead of £50,000, as originally estimated; the liabilities up to that day being more than £90,000. Consequently they would have to obtain powers to provide themselves with additional capital.

Alderman TOWERS seconded the motion.

Mr. KITCHEN said the Water Committee had incurred a great amount of liability for which they had not powers to pay up to the present time; and it was well understood by a majority of the Council that they would have to obtain a Provisional Order to borrow more money, so it did not come on them by surprise. He might state that in 1882 the Water Committee contributed to the borough fund £500; in 1887, £500; in 1888, £500; in 1889, £200; and this year they did not propose to make any contribution. Many important works were taking place at the present time, and others were being extended; and he was afraid that if they did not receive some contributions, they would not be able to retain the rates at their present amount. He would propose as an amendment that of the balance £300 should be transferred to the borough fund; and the remaining portion (£695) be divided between the reserve and the renewal fund.

The amendment was not seconded; and the motion was carried.

PAISLEY CORPORATION GAS SUPPLY.

The Past Year's Working—The Disposal of the Surplus.

The official statement of accounts of the Paisley Gas Trust for the past financial year, which ended on the 28th of May last, has recently been issued—somewhat late in the day, it must be admitted. The Gas Committee report that the gross revenue amounted to £35,134, and the gross expenditure to £27,996; leaving a balance of £7138. Out of this, interest and the additions to the sinking and contingency funds were met; leaving £3663 as the surplus for the year. The balance from the previous year's account was £16,515, out of which £1440 has been paid for public improvements, and £2281 voted to the credit of extension account; leaving £12,794. Adding to this the above-mentioned surplus, there was a sum of £16,757 at the credit of the profit and loss account at the close of the past financial year. In dealing with the general working of the undertaking, the Committee state that the quantity of gas sold and accounted for amounted to 208,900,000 cubic feet; and the unaccounted-for gas to 11·32 per cent. The average illuminating power of the gas was 27·09 standard candles; and the price, 2s. 10d. per 1000 cubic feet to ordinary consumers, and 2s. 6d. per 1000 cubic feet to the Police Commissioners for the public lamps. The greatest quantity of gas consumed in 24 hours was 1,440,240 cubic feet. During the year 5644 yards of main and service pipes were renewed. The number of meters now in use is 13,910. During the year 1450 were sent out, 952 brought in, and 739 thoroughly repaired. The revenue account shows that the year's outlay for the manufacture of gas reached £21,957 3s. 4d., of which a sum of £11,332 3s. 2d. is set down for coals and wages for storing them; for distribution, it was £2729 18s. 10d.; rents, rates, and taxes amounted to £1985 2s. 1d.; and the various items included under the head of "Management" totalled up to £1239 18s. 8d. These and several other items brought up the year's expenditure to £27,996 5s. 1d. The revenue derived from gas sold (after writing off a sum of £128 13s. 7d. as irrecoverable) came to £29,300 11s. 11d. There was an income of £872 7s. 4d. from meter-rents and the hire of gas-stoves. For ammoniacal liquor and tar, there was received £3428 14s.; and for the year's coke sales £1777 12s. 9d.—together, £5206 6s. 9d. The fee fund yielded £51 16s. 2d. These several sums amounted to £35,134 3s. 2d., in the shape of gross income; so that there was a balance to go to the profit and loss account amounting to £7137 18s.

When the statement of accounts and the Gas Committee's report came before the Gas Trust at the last meeting of this body, their adoption was moved by ex-Bailie Macfarlane, Convener of the Committee, and seconded by ex-Treasurer M'Gown, a former Convener; and the motion was unanimously agreed to. It was then resolved that the price of gas for the current year should be continued at 2s. 10d. per 1000 cubic feet. The subject of the disposal of the year's surplus (£3963) next came up for consideration. Mr. Wilson moved that £2788 16s. 6d. of it should be applied in the extension of the gas-works. He remarked that it was proposed to enlarge the works at an expenditure of upwards of £30,000; and he thought it would be very unwise to place all that amount to the capital account as a permanent burden. It would be much better for them to vote some of the surplus for the purpose of extinguishing, in ten or twelve years, the amount they were now expending. Bailie Paton seconded the motion; and, in the course of his remarks said, as to the sinking fund, that they had had before them an application for electric lighting, and this should put them on their guard, and make them reduce the debt as far as possible. A long discussion ensued. Ex-Provost Cochran found fault with the Gas Committee for not having set something aside for public improvements. The plea that to do so would be oppressive on the poor was disposed of by the fact, shown by the accounts, that people paying rents under £10 paid one-sixth of the price of the gas consumed, and those occupying premises of £10 and upwards paid five-sixths. Now another argument was brought forward that they must wipe off the debt of £30,000. This could have been used before, because they had always been owing a great many thousands of pounds. The Legislature had wisely provided that, while they countenanced the borrowing of money for establishing such works, they should gradually pay off, with a sinking fund, the loans obtained; and what they had hitherto done they could do again. After some further remarks about burgh rates, he said the increased taxes made Paisley the heaviest rated town in Scotland. They could not further tax the people; and to refuse to give the odd sum of £788 would really stop improvements. They were supplying the cheapest gas in Scotland, and the weight was falling on the well-to-do, who did not complain. He proposed, as an amendment, that of the £2788 the odd sum of £788 should be paid to the Police and Public Improvement Department, and the £2000 devoted to the extension of the gas-works. Ex-Treasurer M'Gown seconded the amendment, and made a few remarks in support of it. Then ex-Bailie Macfarlane (Convener of the Gas Committee) entered his dissent from the proposal. His reason for doing so was that the cost of extending the gas-works, which would amount to £30,000, ought to be paid off before they took any of the surpluses to extinguish debts connected with other trusts. He maintained, as against ex-Provost Cochran's argument, that it was not the wealthier people who were burdened by the extra price of gas, which was caused by utilizing the surpluses for the benefit of other trusts, for the largest consumers were the highest rented; and if, instead of using gas surpluses for improvements, a rate were imposed, these would have to pay, as landlords and tenants, the whole rate. From the year 1883, gas profits to the extent of £26,000 had been expended in improving the town. He looked upon it as a great hardship to gas consumers that the annual surpluses should be devoted to this purpose. In the further discussion of the subject, the speakers were equally divided in opinion. Provost Johnston (who presided) said he intended to vote for Mr. Wilson's recommendation, as he had done in Committee. Mr. Wilson having replied on the discussion, the vote was taken. There were six votes for the motion, and seven for the amendment; and the Provost declared the amendment carried. Ex-Bailie Macfarlane declined to vote. Had he acted otherwise, the numbers would have been equal; and Provost Johnston would have given his casting vote in favour of the motion, which would then have been carried.

THE PUBLIC LIGHTING QUESTION AT SHEERNESS.

Our readers may remember that a dispute arose a short time ago between the Sheerness Local Board and the Sheppy Gas Company, in reference to an interference which had taken place with the regulators in the public lamps. The result of the quarrel was that the Local Board determined not to have any further communication with the Company until certain expressions contained in a letter had been withdrawn. At the last meeting the matter was again incidentally referred to, on a proposition made by one of the members that the Surveyor should be directed to obtain information from electric lighting companies as to the cost of lighting the public lamps by electricity. This gentleman said he considered it was time the Board did something for themselves, as they "were told they could not look at the lamps without the permission of the Gas Company." Another member remarked that, seeing the "extortionate price" charged for gas in Sheerness, and the rapid strides being made with the electric light, he thought the Board should find out the price of lighting the public lamps; and then if the Gas Company could not compete with the electric light, it would be time for the Board to take action. Electric lighting was, he said, being adopted in many towns, and the last price he saw quoted for lighting the public lamps with a "flame" of 16-candle power was £2 6s. per lamp. The Board at present paid £3 2s. to the Gas Company. The motion was carried unanimously. It is to be regretted that these gentlemen, in their desire to depreciate the Gas Company, allowed themselves to wander a little from the actual facts. The Directors never told the Board they could not "look at" the lamps without permission; but they certainly objected to an inspection of the regulators therein in the absence of one of their own representatives. The gentleman who talked about the "extortionate price," and who, we believe, assisted in the interference with the regulators complained of by the Company, made several random statements which we fancy it would be difficult for him to substantiate if put to the proof. He said the lamps could be lighted by electricity "with a flame (!) of 16-candle power" for £2 6s., as against £3 2s. paid by the Board. We say nothing as to the "16-candle flame" electrically produced; but as a matter of fact, we believe that, for the year ending the 30th of June last, the Board were charged £2 7s. 3d. for the gas consumed in the public lamps—being 14,538 cubic feet, at 3s. 3d. per 1000, feet the price authorized by the Company's Act. As this figure compares well with the prices charged in other towns similarly situated to Sheerness in regard to the supply of raw material, we fail to see the "extortion." But when a gas company have to be decried, it does not seem to matter how reckless may be the statements made they are eagerly swallowed as truth.

The Purchase of the Douglas Water-Works by the Corporation.—Monday of last week was the day for the completion to the sale of the Douglas water-works by the original Company to the Douglas Town Commissioners for £146,000. A cheque for this amount was tendered in the morning by the Commissioners to the Directors of the Company, who refused to accept it, and demanded cash. The Commissioners applied to their bankers (Dumbell's Banking Company, Limited), who, although the sum was large, were enabled to comply with the demand; and £50,000 in gold, and the remainder in Bank of England notes, was duly paid at the Company's office. The event caused great excitement in Douglas.

PROVINCIAL GAS AND WATER COMPANIES.

The subjoined paragraphs give the results of the working of various Provincial Gas and Water Companies during the periods referred to.

Gas Companies.

The seventh half-yearly report of the Barry and Cadoxton Gas and Water Company states that the gas-mains have been laid and gas supplied to Cadoxton, and mains laid in a number of streets now being formed between Cadoxton and Holton. Gas and water are now available for use between East Barry and Cadoxton, where a considerable number of houses are being erected, and a revenue from this part of the district may reasonably be anticipated. The pumping-engines and boilers and the high-level reservoir are practically completed, and are expected to be in use shortly. The low-level reservoir will, in the ordinary course, be completed by the end of October. Services for about 1200 water supplies have been connected to the mains, and nearly 500 gas-services, including 100 public lamps. Of the 500 gas supplies, about 250 are in use; and the number of consumers of both gas and water is daily increasing.

The half-yearly general meeting of the Dover Gas Company was held on Monday last week—Mr. W. Mannering in the chair. The Directors' report showed a sum of £3367 available for division, out of which the full dividend at the rate of 7½ per cent. per annum (less income-tax) was recommended, the payment of which would leave about £722 to be carried forward. Owing to the higher cost of coal, the Company had to raise the price of gas 5d. per 1000 cubic feet from July 1 last. The Chairman, in moving the adoption of the report, stated that although, in common with other gas companies, the Directors had to tell a story of diminished profits, brought about by the increased cost of coal, necessitating a rise in the price of gas, the business in the past six months had not only proceeded in a satisfactory manner, but been progressive. The sale of gas had exceeded that of the corresponding half of last year by 7¾ per cent. The quantity sold was 77,281,900 cubic feet, as against 71,698,700 cubic feet, and was equal to 10,213 cubic feet per ton of coal carbonized, which was very creditable to the Engineer (Mr. R. Herring) and stokers, who, he was proud to say, were doing their work in a very satisfactory manner. Turning to the accounts, the revenue, as compared with the corresponding six months, showed an increase of £401 17s. On the other hand, the expenditure had been more by £1769 17s., of which £1540 14s. 9d. was due to the increased charge for coal. In addition to their contracts, the Directors had to purchase several cargoes, for which they had to pay very high prices. Early this year freights were exceedingly high; the cost at the works being 3s. 2½d. per ton more than in the corresponding half year. The profit balance was, in consequence, much reduced, and insufficient for the dividend. In addition to £1225 0s. 4d., the profit for the half year, the sum of £1419 13s. 6d. was needed for the dividend, which was drawn from the surplus profit balance of former years—leaving £722 17s. 11d. to be carried forward. In conclusion, he was pleased to mention that the relations between the Directors and the men were of the most friendly and cordial character. In fact, everything in connection with the Company was working most smoothly and satisfactorily; and, looking at their position from every point, he thought the proprietors would say it was one of great strength and soundness. The report was adopted; and the business closed with the usual complimentary vote to the Chairman and Directors.

The annual report of the Directors of the Hartlepool Gas and Water Company, of which the chief features were given in the JOURNAL for the 26th ult., was submitted at the meeting of the shareholders last Friday week. In moving its adoption, the Chairman (Mr. W. H. Fisher, J.P.) said he had again to congratulate the proprietors upon the very satisfactory year they had had. He was glad to say the make of gas had reached 239 million cubic feet during the twelve months, or an increase of 21 million feet, or 9 per cent. more than the previous year; and, compared with 1888 (when it was no more than 47 million feet), an increase of 192 million feet. He was sorry the profits had not kept pace with last year, in consequence of the increase in wages and the still greater rise in the cost of coal. The sale of gas had realized £25,129—a gross increase of £2429. The residual products also compared favourably with previous years' results; coke having produced £1008 as compared with £307, and the sulphate, £668. Against these items, they had an increase in wages of £562; and in the cost of coal there was the large excess of £2065. The quantity of coal carbonized was 23,643 tons; or an additional quantity of 2200 tons. The number of cooking-stoves hired out last year was 383, as against 286 in the previous year. He referred to this item with pleasure, because no small proportion of the extra consumption of gas was due to the lending out of these stoves. Turning to the water account, he found the increased gross revenue to be £2068; having sold 76 million gallons of water more. In the previous year they paid a dividend of 7 per cent. all round; but this year they proposed to pay 7½ per cent. on the "A" and "B" shares and 7 per cent. on the "C" and "D" shares; leaving £6180 to be carried forward. In referring subsequently to the advanced cost of coal, the Chairman said that the Directors had decided not to disturb the price of gas for the present; believing that the cheaper the article, the greater would be the consumption. If, however, the consumption did not increase during the next three or four months, the Board would have to reconsider the question. The report was adopted.

The annual meeting of the Morecambe Gas Company was held last Friday week; and the report, from which we gave some particulars in the JOURNAL for the 26th ult., was generally considered by the shareholders to be a very satisfactory one. The Chairman (Mr. Matthew Simpson) gave some figures showing the improvement in the income. The increase in the receipts for private lighting amounted to £390; for public lighting, £56; and for cooking and heating purposes, £107. The residual products had produced an additional £102; and the receipts from meters, and hire of stoves and fittings, gave an additional £32—making altogether an increase of £687. Against this there were certain advances in the expenses for manufacturing and distributing gas, which left the net increase in profits at £246. The quantity of coal carbonized was 1970 tons—an increase of 344 tons on the previous year. In the past twelve months 18,732,000 cubic feet of gas were made; being an increase of 3,688,800 cubic feet. The report was adopted; and a dividend of 5 per cent. was declared, making, with the interim dividend, 9 per cent. for the year. The Manager (Mr. W. Duff) was thanked for the close attention he gave to the Company's affairs.

Last Friday week, the annual meeting of the Newmarket Gas Company was held. The accounts presented for the financial year ending July 31 showed that the total receipts (including £464 brought forward) amounted to £9437. Deducting from this the ordinary expenditure, a profit remained of £2993. The report and accounts were adopted by the shareholders; and a dividend at the rate of 11 per cent. upon all the capital was declared. This will absorb £2696; and leave the sum of £297 to be carried forward. This is a very satisfactory result; seeing (as the Secretary and Manager, Mr. J. H. Troughton, reminds us) that the price of gas was reduced 4d. per 1000 cubic feet early in October last.

The Directors of the Reading Gas Company reported at the recent meeting of the shareholders that, owing to the increase in the price of coal and the advance in wages, they had found it necessary from March last to revert to the price which was charged up to June 30, 1889. The Directors, having established a depôt for the exhibition of cooking and other stoves, remarked that they found the plan answered admirably of letting them out on hire. Acting under the powers given by the shareholders in February, they also stated that they had issued 100 7 per cent. shares, which realized satisfactory prices. The revenue for the six months amounted to £21,899. Of this sum the sales of gas produced £16,789; and the residual products, £5110. The disbursements totalled to £17,345, which left a balance of £4554 to be carried to the profit and loss account. The latter exhibited a disposable amount of £13,895. The report and accounts were adopted; and the full dividends were declared.

The annual meeting of the Sunderland Gas Company was held last Wednesday, when a general state of contentedness seemed to prevail among the shareholders. The Chairman (Mr. E. C. Robson), in moving the adoption of the report and accounts—from which we extracted some particulars last week—said this was the twentieth consecutive year they had declared a dividend of 10 per cent. Referring to the increase in the cost of coal, he remarked that two years ago the average price they paid was 6s. per ton; in the year just closed they paid 8s.; and, so far as they could see, in the current year the price would be 11s. It would be observed that the cost of residuals bore a very handsome proportion to the price of coal; but there was an increase in the price of labour of £2677. They were threatened with a strike in December; and having an eye on two matters, the rights of the shareholders and the rights of the labourers—the rising tide was with them—and also to the rights of the consumer, the Directors gave in to a considerable extent, and granted the men an increase of pay for the same amount of work. How long this state of things was going to continue, he could not tell; but he believed the Company stood pretty well with their men. They had been well served, and had been able to keep faith with the town. The Chairman then alluded, with great sorrow, to the illness of Mr. J. H. Cox, jun., who had served the Company to the best of his ability, with the perfect confidence of his employers, and who seemed to have been stricken down with illness at a time of life when his usefulness was about becoming the greatest. He hoped the opportunity the Board had given him of going abroad to a purer atmosphere (more conducive to health) might tend to his perfect recovery. Mr. J. Stokoe seconded the motion, which was unanimously adopted. The dividend recommended was also declared.

At the meeting of the West Kent Gas Company yesterday, the accounts for the six months ending June 30 were submitted. As compared with the corresponding period of last year, a slight improvement was shown by them. The amount produced by the sale of gas was £6083; and by residuals, £1292. Two or three minor items brought the total receipts to £7445. The expenditure totalled to £4655, which left a sum of £2790 to be carried to the profit and loss account. The balance of net profit at the credit of this account was £6058; and from this the Directors recommended that the statutory dividends should be paid. The Directors reported that a new lift had been added to the Company's large gasholder at Erith, to meet the necessity of increased storeage in that district.

Notwithstanding the increased price of coal, the accounts of the Weston-super-Mare Gas Company for the half year ending June 30 last exhibit a better result than the corresponding period of the previous year. The revenue account showed that the receipts amounted to £6294; and the expenditure to £5040. The Manager's (Mr. J. H. Gray's) report stated that the quantity of gas required by the consumers was still steadily on the increase. The total amount made during the half year was 33¼ million cubic feet—an increase of about 1,150,000 cubic feet compared with the first half of last year. The tar and coke had risen in value, assisting in a small degree to meet the extra advance given in wages to workmen, but not covering any extra cost for coal. The price of coal averaged an advance of about 1s. 8½d. per ton to the end of June last. New contracts had been entered into for the next twelve months at a further average all round of 2s. 9½d.; making a total extra cost for coal in the two years of 4s. 6d. per ton. The gas made averaged 9860 cubic feet per ton of coal carbonized; and the unaccounted-for gas was only 3·5 per cent. The statutory dividends for the half year have been declared.

Water Companies.

The net revenue of the Brymbo Water Company for the year ending June 30 last, amounted to £1614; making, with the balance brought forward, £1647. The interest on loans and the interim dividend at the rate of 5 per cent. per annum paid last March absorbed £858; leaving available for disposal £789. From this a dividend at the rate of 6 per cent. was declared at the meeting of shareholders a few days since.

In their half-yearly report presented at the recent meeting of the Cambridge Water Company, the Directors recommended the payment of a dividend on the consolidated stock at the rate of 10 per cent. per annum, and upon the amount paid on the new shares at the rate of 7 per cent. per annum. In order to pay this dividend, the sum of £302 will have to be taken from the balance brought forward from the previous half year It was also stated that the Assessment

Committee of the Cambridge Union proposed to raise the rateable value of the works from £2500 to £3300. The Directors appealed, and an assessment of £3000 was agreed upon. The report was adopted.

The accounts of the Drogheda Water Company for the past year show a net balance to the credit of revenue account of £661, out of which a dividend of 3 per cent. has been declared.

The accounts of the Lewes Water Company for the year ending June 24, which were submitted at the meeting of shareholders last Thursday week, showed receipts amounting to £3093; and an expenditure of £1140. There was therefore available for dividend £1952. The interim dividend paid in February last amounted to £815; so that there remained for disposal the sum of £1137. The Directors recommended the declaration of a dividend of 5 per cent. upon the original share capital of £6000 (making with the interim dividend 10 per cent.), and a dividend of 3½ per cent. upon the new share capital of £13,000 (making with the interim dividend 7 per cent.), and, after the payment of the preferential dividend of 2½ per cent., to pay the holders of the original shares £1 5s. per share in part payment of the arrears due to them. These dividends, together with the additional payment to the holders of the original shares, absorb the sum of £1115 and leave £22 to be carried to the reserve fund, which will then amount to £37. The report, with the recommendations contained therein, was adopted.

It was reported at the recent half-yearly meeting of the Maidstone Water Company that the water-rental for the past six months amounted to £3655, and that the profit was £1963, making the sum at the credit of profit and loss account £1964. A dividend was declared, free of income-tax, for the half year of 3¾ per cent. on the 10 per cent. shares, and of £2 12s. 6d. per cent. on the 7 per cent. ordinary shares. These payments will absorb the sum of £1611 15s., and make the dividend for the past year on the 10 per cent. shares 8½ per cent., and on the 7 per cent. shares £5 17s. 6d. per cent. As already mentioned in the JOURNAL, it was also resolved to grant an annuity of £25 to the widow of Mr. Ware, the late manager of the works.

The report of the Directors of the South Staffordshire Water Company, from which we gave some particulars in our issue of the 19th ult., was submitted for adoption at the meeting of the shareholders last Thursday week, by the Chairman (Mr. F. James). In the course of his speech, he stated that there had been an increase in the engine charges, as compared with the corresponding period of last year, of nearly £500—from £3076 to £3536. Of this increase £100 was attributable to the larger quantity of coal consumed (on account of the larger amount of water pumped), and £360 was due to the enhanced price of coal. Although the Company had thus to pay higher prices for materials, no increase could be effected in the price charged to consumers using water for domestic purposes. The increase in maintenance charges amounted to £500; of this, £250 had reference to repairs of reservoirs, and £115 had reference to meters. The total amount of capital still available for use was about £65,000, which, although issued to the shareholders, had not been fully paid up. The number of houses supplied had, as nearly as possible, doubled during the past ten years; and there was also a considerable increase in the demand for supplies for manufacturing purposes. Therefore they were not altogether without fear that the present supply at the command of the Company would prove inadequate to the future requirements. Under the circumstances, it would not be very long before the £65,000 would have to be called up. The report was adopted.

The accounts of the West Surrey Water Company for the half year ended June last exhibit an income amounting to £2372; and an expenditure of £954—being an increase in income of £80; and in expenditure, a decrease of £4. In the six months 2239 yards of cast-iron pipes were laid for extension of service-mains, and 70 new supplies were connected; representing a future rental of £126 per annum. The balance brought forward from the previous half year was £166, which, added to £1417, the amount to the credit of the past six months' working, equals £1583. After deducting the interest on the mortgage loans and debenture stock, a balance is left of £1332 1s. 4d. At the recent meeting of the shareholders, at which Mr. A. Telford Simpson, C.E., presided, the report was adopted; and a dividend at the rate of 3½ per cent. per annum was declared upon the ordinary shares.

The half-yearly meeting of the Woking Water and Gas Company was held last Tuesday week, at Winchester House, Old Broad Street, E.C. The Chairman (Lieut.-Col. E. Galt), in moving the adoption of the report, remarked that there were no accounts to be presented, as they were only made up once a year. The report stated that the total expenditure on capital account up to the end of June amounted to £64,537. The receipts for the six months were £1884; and the expenses on revenue account, including depreciation, £806. The balance carried to profit and loss account was £1077; and the balance available for division, £984. Mr. C. Horsley, J.P., seconded the motion, which, after a short discussion, was unanimously carried. A dividend at the rate of 3½ per cent. per annum was declared.

The accounts presented at the recent annual meeting of the Wrexham Water Company were of an exceedingly satisfactory character. The expenditure on capital account during the year amounted to £4635, incurred chiefly in extending the mains to various portions of the Company's district not hitherto supplied, and also in carrying on works to augment the sources of supply. The receipts upon water and fittings account showed an increase of £452, as compared with the preceding year. In moving the adoption of the report, the Chairman (Mr. W. Overton) alluded to the gratifying fact that the Directors were enabled to recommend an increased dividend. The receipts from water rates and sales, he said, exhibited an advance of nearly £5000—the largest the Company had ever had. The report was approved; and dividends of 4½ and 5 per cent. upon the different shares were declared. At a special meeting held immediately afterwards, the Directors were empowered to raise £10,000 additional capital.

The Whitehaven Trustees and the Gas Company.—At last Tuesday's meeting of the Whitehaven Trustees, it was agreed, on the recommendation of the Gas Bill Committee, that application be made to the Gas Company to ascertain if they were willing to treat with the Trustees for the sale and transfer of their undertaking.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Annual General Meeting of this Company was held last Saturday week, at the Offices, Willoughby Lane, Tottenham—Mr. GEORGE GRIPPER in the chair.

The SECRETARY (Mr. James Randall) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the statement of accounts for the half year ending June 30 last, an epitome of which was given in the issue of the JOURNAL for the 26th ult. (p. 457).

The CHAIRMAN, in moving the adoption of the report, said that the accounts the Directors submitted were, considering all things, very satisfactory. The increase in gas-rental, as compared with the June half of 1889, was £4 18s. 1d. per cent.; and the additional gas supplied was 5·90 per cent. The residuals had assisted the Company very much; a better price having been received on almost all of them. Especially was this so in regard to coke and sulphate of ammonia; these two items alone going far to cover the extra expenditure to which he would refer later on. Alluding to the sale by tender of the Company's new stock during the six months, he said he thought it was eminently successful; being an entirely new move for the Company. Notices respecting this stock were sent to each of the proprietors, and advertisements were inserted in various newspapers; the result being that the whole amount was taken up at an average price of £168 per cent. This left them a large amount of capital (£6759) which did not bear interest. Referring to the works, the Chairman remarked that, as the demands made by their customers required it, the plant was being added to. They were now building a large coal-store along one side of the retort-house; and this would save a considerable amount of labour in carrying the coal to the retorts, and relieve the Engineer (Mr. W. H. H. Broadberry) and the Directors from much anxiety as to their winter supply. The Engineer reported that the whole of the buildings and plant were in good condition; and he (the Chairman) might say that it had always been the policy of the Directors to keep the plant in a satisfactory state. Coming to the financial results of the half year, he said that the profit and loss account showed an available balance of £9605, out of which the Directors recommended the payment of dividends, less income-tax, on the "A" stock at the rate of 11½ per cent. per annum; and on the "B" and "C" stocks, of 8½ per cent. These dividends would amount to £5989, and leave a balance of £3615. This was a few pounds less than was carried forward at the end of June last year; the decrease being due to the increased cost of labour. It would be remembered by the shareholders that, at the time of the last meeting, they were to some extent in difficulties with their men. These difficulties had had to be met by an increased payment, and decreased hours of labour, which would make a considerable difference to the Company. In a conversation he had with the Engineer the previous day, he found that labour now cost them 1d. per 1000 cubic feet more than it did in the corresponding period of 1889. The cost of coal had also risen greatly. Commencing with this half year, they would have to pay for their coal supply from 3s. to 3s. 4d. more per ton than was done this time last year. However, even in this respect they were favourably placed, as some other gas companies were paying considerably more than this. Nevertheless, 3s. per ton would tell materially against their reserve of profits. The average price of coal last year was 15s. 5½d. per ton (this included the City dues); while now it would cost about 17s. 11d.

The DEPUTY-CHAIRMAN (Mr. J. Malcolm) seconded the motion, which, without discussion, was unanimously carried.

On the motion of Mr. J. WARREN, seconded by Mr. W. H. LANG, the dividends recommended were declared.

The CHAIRMAN next moved the re-election of Mr. Malcolm as a Director; observing that he had been a member of the Board for 38 years, during which period he had given universal satisfaction.

Mr. WALTER LOW seconded the motion, which was agreed to.

Mr. A. H. BAYNES proposed the re-election of the Chairman, who also retired by rotation, and in doing so, he congratulated him and his colleagues on the satisfactory report they were enabled to present, notwithstanding the numerous difficulties they had had to encounter of late.

Mr. CORBET WOODALL seconded the proposition, which was carried unanimously.

Mr. MALCOLM and Mr. GRIPPER having acknowledged this renewed mark of the confidence of the shareholders in them,

The retiring Auditor (Mr. A. Nicol) was reappointed, on the motion of Mr. J. L. CHAPMAN, seconded by Mr. LOW.

Mr. WOODALL, in moving a vote of thanks to the Secretary, the Engineer, and the other officers, said it had already been remarked by the Chairman and an honourable proprietor that the past half year had not been the most easy in the experience of the Directors and officers. It had been a trying time in more respects than one; and the current half year, and probably several to follow, would be of a somewhat similar character. He did not refer to the difficulties with the workmen, as he believed they were in a fair way of being adjusted satisfactorily; but it would require all the energy of the Directors and officers to maintain such a report as they had presented that day. It was very gratifying to the Directors to know that they had good officers, and to feel satisfied that nothing they could do to promote the success of the undertaking would be left undone.

Mr. LOW having seconded the motion, it was unanimously passed without comment.

The SECRETARY and the ENGINEER both returned thanks; the latter observing that the balance-sheet had turned out better than he had expected.

Votes of thanks were also passed to the Directors and to the Auditors (Messrs. A. Nicol and A. H. Baynes); that to the latter gentlemen being moved by Mr. LANG, and seconded by Mr. R. P. KEYS.

Mr. BAYNES, in responding for the Auditors, said he would take this opportunity of thanking the Directors for the consideration they had shown him during his absence in India, and also Mr. J. L. Chapman, who had very kindly acted as his *locum tenens*.

The proceedings then terminated.

THE GAS SUPPLY OF LONDON.

Laymen on Gas Companies and Gas Manufacture.

The members of the oddly-named Balloon Society of Great Britain, assembled at St. James's Restaurant, Piccadilly, last Friday week, had under consideration that vast subject, the Gas Supply of London. They did not, however, content themselves with dealing with obvious facts regarding the supply, but some of them entered into questions relating to the manufacture of gas, and in a way which showed that their ideas thereon were of a rather hazy description.

Mr. Edmund Kimber (whose only qualification for dealing with the matter was, on his own showing, that he had been "over the Beckton and several other gas-works") was to read an introductory paper; but before calling upon him, the President of the Society (Mr. W. H. Le Fevre), who was in the chair, made a few prefatory remarks. The gas companies, he said, had done wonders; they had "enlightened" us for many years past. But anyone who took the trouble to read their balance-sheets would be startled to find, even in the case of the largest Company in the world—The Gaslight and Coke—that during the past year they had scarcely been able to pay the modest dividend of 5 per cent.; in fact, it was a question whether they had not had to take a certain amount out of reserve for that purpose. His object in speaking, however, was not to "pitch into" the gas companies, except to say that they ought to have kept pace with the times. They had not introduced the improvements which they might have done; and there were now competitors in the field. Great advances had been made in the means of giving light by oil; and also in the electric light. Of the latter, however, he did not think so much as a competitor, except for the lighting of large buildings. He confessed that the gas companies had had some difficulties to contend with in the past year, in connection with the increased prices of labour and raw material; and he here complimented Mr. Livesey on the stand that he made against the unjust demands of his men. The companies had had to pay something like an increase of 25 per cent. for labour; and the cost of coal had likewise risen. Therefore, if they wished to retain the dividends they had had for some years, they would now have to alter their tactics. Some of the coal gas companies of America had combined with their business that of supplying electric light and oil gas. But in England, he reiterated, they did not keep pace with the times; and if they continued to raise their prices as the Chartered Company had done, they would soon have oil and other inventions coming to the front, to take the place of the old-fashioned system of making gas from coal.

Mr. Kimber then read his paper, of which the following is the substance: Practically, three Companies supply the whole of London with gas. First comes The Gaslight and Coke Company, who supply 19,000 million cubic feet; second, the South Metropolitan Company, who supply 6000 million feet; and third, the Commercial Gas Company, who supply 2000 million feet—making together a total of 27,000 millions. For every 10,000 feet of gas, they use a little more than a ton of coal; but putting it exactly at a ton, this gives a total coal consumption every year of 2,700,000 tons. This is a greater quantity than is turned into gas in the whole of France. For some years past (up to June 30 of last year) this has produced a tolerably regular profit of something like £1,300,000 a year, and has paid the shareholders about 13 per cent.—their total capital being about £10,000,000 in shares, and £4,000,000 in debentures. Instead of earning 13 per cent., this money now earns less than 5 per cent.; and though the payment of such large dividends in years gone by has forced up to a premium the greater part of the shares, which are called "ordinary stock" (to more than double the par value), in reality the stock is not worth so much as par value to-day. This I shall show more at length presently. If the London County Council were to buy the undertakings, they would not do so on past earnings, but on present. All the shareholders could expect would be 20 years' purchase of the present net earnings. This would be considerably less than par. Instead of being £15,000,000, probably £12,000,000 would be nearer the figure—notwithstanding that the market price to-day is something like £26,000,000. This price, however, is only kept up on hopes and expectations of better times. The capital value of the Companies' works is about £13,000,000; and if upon the greater part of this the shareholders have been getting 13 per cent. for several years, and as they only gave this sum for their property, they will not lose much by being taken over by the ratepayers, who, by using oil for making gas instead of coal, could conduct the business much more economically, without smoke, or stoking, washing, &c. Though 27,000 million cubic feet of gas is the total quantity made, it is not all sold. In the process of storeage and distribution, there is always a certain amount lost, wasted, or unaccounted for, though this varies with the degree of care and skill employed in the operation. The Gaslight and Coke Company lose 7 per cent. of their make; whereas the South Metropolitan only lose 4 per cent. The coal of the former costs them 14s. a ton; and the net cost of their gas is 1s. 9d. per 1000 feet. The South Metropolitan Company's coal costs them 12s. a ton; but the net cost of their gas is 1s. 10d. per 1000 feet. In the accounts of the latter, however, for the last half year, they have included £31,000 for miscellaneous charges, which embrace the expenses of the late strike. Had they not done so, their net cost would have been only 1s. 7½d. per 1000 cubic feet. Though The Gaslight and Coke Company have avoided a strike, they have done so at enormous cost, and have taken £350,000 out of their working capital, instead of putting it under the head of miscellaneous charges against revenue. As the charge made for gas by The Gaslight and Coke Company is 2s. 9d. per 1000 feet, and their cost of manufacture is 1s. 9d., their profit is only 1s. per 1000 feet; but if the £350,000 be put (as it ought to be) against revenue, they have during the last half year made no profit whatever. As it was, their total net profit was only £271,000; whereas they paid in dividends £462,000—thus leaving a difference of £191,000 to be made up from some source or other. They did not take this from their reserve; so they borrowed money to enable them to do so. The South Metropolitan Company only made a profit of £44,000; but they paid in dividends a sum of £119,490, leaving a difference of £75,000, which they made up partly out of their reserve, and partly from the insurance fund. One newspaper commenting on these figures says that The Gaslight and Coke Company made up their difference, or dificiency, of £191,000 out of undivided profits; but this is not so. The reserve is their fund of undivided profits; and the Chairman at the last meeting of the shareholders said distinctly that they had not dipped into the reserve yet, but might have to do so next year. Practically, therefore, the Company, according to their balance-sheet, admit that they only earned 7½ per cent., whereas they paid 13 per cent.; and in like manner the South Metropolitan Company only earned 4½ per cent., whereas they paid 12 per cent. Had, however, the £350,000 spent out of working capital been placed against revenue, as it ought to have been, The Gaslight Company would have not only shown that they had earned nothing, but, instead of making any profit, they would have made a loss of nearly £100,000. At the last meeting, the Chairman deliberately said: "We now require £650,000 more capital, which I may divide into three items. First of all, we want £350,000 to restore the floating capital we are short of. In the second place, we want £200,000 to represent the increased coal stock which we have found it necessary and desirable to have on our premises. The floating capital and the extra coal stock will therefore absorb £550,000. The third item of £100,000 is for the works we have in hand, and on which we have spent £30,000 during the past half year." To meet this they borrowed £467,000 of 6 per cent. debenture stock and 7 per cent. preference stock. The former they issued at a premium of 60 per cent., and the latter at 45 per cent.—*i.e.*, £160 and £145 respectively. How this was justified in the face of the balance-sheet, and the Chairman's statements, it is difficult to conceive.

As he read the paper, Mr. Kimber enlarged very considerably upon many of the points contained therein. In speaking of the value of the Gas Companies' stocks, he said he believed the price of the South Metropolitan Company's was £235; and they paid a dividend of 12 per cent. Supposing they only earned 5 per cent., would anyone tell him they would give £235 for only £5 a year. He pointed out that Mr. Livesey, in addressing the shareholders of his Company at the recent meeting, said there was not the slightest doubt that there was a period of great prosperity in store for gas. He (Mr. Kimber) hoped there was. But when Mr. Livesey added that he had to dip into the reserve, in order to pay the shareholders' dividends, and would have to do so again, and Colonel Makins said he was going to dip into the reserve for the same purpose, this did not appear like a coming period of prosperity. He should say that this dipping into the reserve rather indicated a period of retrogression. But, of course, the object of these gentlemen in saying this was to buoy up the shareholders with the hope that times would be better than they were now, as naturally no shareholder liked to be made to feel uncomfortable. When on the question of the unaccounted-for gas, Mr. Kimber said he should like to know why The Gaslight Company lost 3 per cent. more than the South Metropolitan Company. He thought something must be radically wrong in their system. Mr. Le Fevre interrupted him with the remark that he considered a loss of only 7 per cent. was rather low; but this did not appear to satisfy Mr. Kimber. In dealing with the finances and dividend of The Gaslight Company, he called attention to the fact that, immediately after the last meeting of the Company, advertisements appeared in the papers inviting people to subscribe for a large amount of preference stock, at a high premium; and he laboured hard to show that some of this money was absolutely needed by the Company before they could pay the dividend declared. If this were not so, why, he asked, were they in such a hurry to get the money? As to the prospects of the Companies, Mr. Kimber magnanimously told his audience that he had "some sympathy with these Gas Companies;" and he thought they had been hit very hard by the Trades Unions. The Directors had conceded the men eight hours, in place of twelve; and the latter had now all sorts of privileges and emoluments. It would be said: "The dispute between the men and the Companies is practically settled. The men asked for more privileges; and the Directors granted them. Therefore it is to be assumed that they admitted the justness of the men's case." Well, if it was true that the men were not receiving more wages than they were fairly entitled to, who would say that they were to take less? Therefore, argued Mr. Kimber, if they were not going to be content with less, and the Companies were not now earning 5 per cent., what was to be their position in the future? The coal question was another thing that had contributed to the present "disastrous position" of the Companies. "Disastrous!" exclaimed an incredulous individual in the audience. "Yes, disastrous," said Mr. Kimber emphatically, "I have seen the dividends go up from 5, 6, 7, 8, to 13 per cent.; and now I am sorry to say they cannot earn 5 per cent." If the process of dipping into their reserves was to continue, there was not, he maintained, a very lively prospect for them. The question resolved itself into this—What is the alternative for the Companies? Upon the strength of this disastrous depression, he proceeded to observe, some gentlemen formed what was called the Automatic Gas Company; and the plant used in their system was illustrated by the diagrams on the wall, which Mr. Le Fevre had had prepared for him. [One of the diagrams exhibited pourtrayed a retort-house worked under the "existing system;" and eleven men, in a semi-nude condition, were shown charging the retorts with scoops. On either side of this diagram were others illustrating the Avery system of making gas. One depicted a small plant and a bench of retorts, between which stood a gentlemanly-looking fellow, stylishly dressed, and with a stick in his hand—not a very fit costume for a person working an Avery or any other gas plant. However, Mr. Kimber stated that he was assured this was how the man could work, "as he had only to turn a tap." (Happy man!) The third diagram represented a plant which was being operated by three men, as against—and this Mr. Kimber particularly urged his audience to mark—eleven men under the "existing" system.] Mr. Kimber did not appear to be acquainted with the many inventions which have been introduced to ameliorate the conditions of working in the retort-houses. Charging and drawing machines he had evidently never heard of; and he sketched a horrible picture of what the stokers had to undergo. "Have you ever," he solemnly asked his audience, "read a description of Hell?" and the inquiry was irreverently answered by an outburst of laughter. "Well, I may say," he continued, "that nothing could

more beautifully illustrate Dante's 'Inferno' than the drawing of coke from gas-retorts." Having stated that in the Avery system the gas was produced from oil, Mr. Kimber referred to the oil-wells of America; and said that oil bore upon the gas question in this way: The Gas Companies of the Metropolis consumed 9000 tons of coal a day; while of oil they would use only 1700 tons. The surplus daily production of refined oil was between 1300 and 1400 tons; but in making gas refined oil was not required. The distillate of the oil, or the crude oil itself, could be employed. In New York, the distillate cost only 1¼d. per gallon, as against 4½d. for refined oil. The carriage to London would be only about 1d. per gallon; making the price 2½d. per gallon, or £2 10s. per ton. Thus there would be a considerable saving by using 1700 tons of oil at £2 10s. per ton, in place of 9000 tons of coal at 13s. per ton. Besides this coal gas only gave a light of 16-candle power, whereas oil would give a light of 26 candles. Therefore light for light, oil had an advantage over coal, besides which stoking was got rid of, and, with the Avery system, a gentleman attendant could be employed. One of the auditors inquired, "What about the working men?" Was it certain, replied Mr. Kimber, that the use of oil would be against the interests of the workmen? The Gas Companies would be able to pay larger dividends; and this would indirectly benefit the men. Moreover, those who were now engaged in stoking could be employed in the distribution of the gas. [It did not occur to his interrogator to ask what was to become of the men at present occupied in the distribution work.] In his concluding remarks, he told his hearers that Mr. Trewby, the Chief Engineer of The Gaslight and Coke Company, had informed him that they intended "to go in for oil and water gas soon;" and the Chairman (Colonel Makins) stated, at the last meeting of the shareholders, that they proposed to make 2 million feet of water gas per day. But if they wanted to make any impression at all upon their working, added Mr. Kimber, they should make 200 million cubic feet per day.

Before discussion was invited, the following resolution was put before the meeting by Mr. Le Fevre: "That as the progress of scientific discovery in lighting is constant, the time has arrived when it becomes imperative for the ratepayers to take control of the Gas Companies into their own hands, and that the same be entrusted to the London County Council as the representative body of the Metropolis." Mr. Moyes, C.E., who is a Glasgow man, said that there they took affairs very much into their own hands; and they had profited by doing so. But why a big city like London should let things remain as at present, was beyond his comprehension. In Glasgow both the gas and water supply was under the control of the governing body. Not a great deal was charged for gas; and they did not annoy people in regard to the water. "The City of London," he continued, "should not be 'priest-ridden' by gas managers and gas companies," who cared only for their shareholders; but the profits should be devoted to public purposes. When once *we* eradicate a few of the old-fashioned ideas of the gas managers, he (Mr. Moyes) had no doubt that in Glasgow and many other places the gas would be about one-half of the price it was to-day. Mr. Trewby had been to America to inquire into new systems of gas making; but he had come back with the same stubborn ideas he had previously. Mr. T. M. Kelly followed; and in his remarks he said he was persuaded by what Mr. Kimber had said that the Avery system of gas making was an economical one. He was always in favour of everything that cheapened production; but was very suspicious of anything that came from "Yankee land." Contrary to expectation, the resolution was not to be passed unchallenged. Major Cresswell came forward with an amendment, as follows: "That it is inexpedient to interfere with the existing Gas Companies, and that it is quite unnecessary to purchase their interests, or entrust the control to the London County Council or other representative body." He justified himself in making this counter-motion on these grounds: That he was utterly opposed to the Government interfering in any commercial business whatever; and that such a large matter as the gas supply of London should not be entrusted to the County Council, who had up to the present shown great incapacity. He pointed out that the Gas Companies were governed in regard to their supply and price by laws made by Parliament; and he went on to warn working men that if they oppressed these huge Companies by combination or conspiracies, and tried to coerce them into giving a certain amount of wages, so as to destroy the dividend of the investors, the money of the latter would soon fly out of the country. The amendment was seconded by Mr. Field, who said he had been a considerable holder of shares in two of the London Gas Companies for 25 years. He did not believe the time had arrived for the acquisition of the Companies' property by the County Council. If there was anything in the system of making gas referred to by Mr. Kimber, it should, he said, be "forcibly" laid before the Gas Companies. With regard to the financial position of the latter, Mr. Kimber had stated that they had distributed money they had not earned; but he was in a position to say that they had made a considerable profit. Mr. Grey, referring to the question of labour, said they might as well endeavour "to stop the rising tide," as to try and get back to the old state of things. The Gas Companies could well afford to pay the men even better wages than they did now. If Mr. Kimber could convince the Companies that they could produce gas at a less cost to the consumers than they were doing now, and with a greater dividend to the shareholders, he had proved his case; and the Companies ought to see that every possible improvement was carried out. Major Rigg remarked that some 20 years ago oil gas was made for public supply; but it condensed, and could only be conveyed in the pipes a few hundred yards. He should like to know if this difficulty had been overcome. Mr. Moyes, who stated that he had had many years' experience on all matters relating to oil, replied that it could be carried in pipes almost any distance.

The amendment was negatived, and the resolution carried.

Discovery of Fresh Sources of Natural Gas at Pittsburgh.—A Dalziel telegram from Pittsburgh states that two of the largest natural-gas wells in the neighbourhood have been discovered since Thursday—one being owned by a Philadelphia, and the other by a Bridgewater Company. It is thought that each well will produce sufficient power to drive half the mills in the city.

THE SANITARY CONGRESS AT BRIGHTON.

In the JOURNAL last week we noticed generally the matters of interest to our readers which engaged attention at the recent congress of the Sanitary Institute at Brighton. We now give the portions of the report which pressure on our space compelled us to hold over.

The Brighton Water-Works.

Alderman W. H. Hallett, F.L.S., &c., read an interesting paper on the above subject. He began by pointing out the sanitary advantages of the water supply of Brighton; stating that the water is drawn from tunnels 150 feet below the surface, and pumped into elevated reservoirs varying in heights for the purposes of convenient distribution. These reservoirs are so constructed as to be closed against the action of light and of the atmospheric influences, and contain large bulks of a million gallons and upwards; and the water in them is constantly changing. What is supplied from them by the constant service is as it was first met with below ground. From a sanitary point of view, this constant service of Brighton excels all water supplies not so secluded from the action of light and air; not even excepting the famed Loch Katrine water supplied to Glasgow, or the water of the Vyrnwy, which will shortly be supplied to Liverpool. Touching on the source of supply, the author explained that the water is derived from the Downs; and he described the subsoil through which the rain filters. Adverting to the original public supply of water to Brighton, he said that in 1830 an effort was made by a Company to secure a systematic supply, and the first well sunk was in the Lewes Road; the water being raised by steam power to a reservoir 220 feet high. The supply being easily pumped out, in order to increase it tunnels were driven in the form of a cross, and also to serve as a storeage to pump against. A boring was also tried to a greater depth, but without any beneficial result. In 1852, consequent on great complaints of the inadequate water supply, a new Company replaced the first with powers to carry out extensive works, and also undertaking to give a constant supply. Of this duty the Company afterwards desired to be relieved; but were unsuccessful. They found that, although only 7000 services were connected with their system (hardly half of the then existing houses), their supply was quite inadequate. They sunk a well at Preston, hoping thereby to catch water coming from the upper part of the valley of Patcham; but without good result. The Patcham water was found to draw east, and the tunnels at Lewes Road being extended to the western limit intercepted some of the supply from the Patcham springs. The Directors then sought the advice of Mr. James Easton, who had successfully secured water for the supply of Ramsgate. His method of cutting across the fissures was that which was acted on in all the water stations of the Corporation. He ascertained and proved that where the stratification of the chalk has not been disturbed by upheavals or depressions, the fissures, which are the water conduits, are found to be at right angles (or thereabouts) with the coast line. Each fissure contains a small rivulet—beginning at the supersaturation of the chalk, and flowing on and collecting more water as it proceeds. The sides of the fissures are coloured by infiltrations of particles of the upper clays. The fissures are seldom more than a few inches wide, generally not one inch. Hence there is considerable resistance to the passage of the water. From the outlet, the water stands higher and higher in the wells as the distance increases. In a paper read at the meeting of the British Association in Brighton in 1872, Mr. Easton stated that the maximum of water in the chalk is generally in the month of March; and the minimum in the months of October, November, and December. From plans of curves then shown by him of the varying depths in the wells, the supply appeared to reach them in from 3½ to 4 months after rainfall. He concluded that the chalk acts as a storeage reservoir in retaining the usually heavy rainfalls of the months of October, November, December, and January, during which time evaporation is least in operation. Up to 1865 the whole supply of the Company was drawn from the Lewes Road works, when the Directors began to prepare for a new and independent supply to meet a growing and an expected increasing demand. They then commenced at Goldstone Bottom, on the west side of Brighton. Speaking of the extent of the works transferred by the Corporation, Alderman Hallett said that, in Mr. Easton's paper, he stated that there were two distinct sources of water, each sufficient to give a maximum supply; that there were three sets of engines, each equal to the delivery in 24 hours of the then maximum demand; and that there was storeage capacity in the reservoirs equal to two days' supply. There were then 18,000 services connected, of which 5000 were on the constant system. The tunnels in Lewes Road were 2400 feet; and those at Goldstone, 1300 feet in length. The town was divided into four zones, served from low, middle, high, and higher reservoirs. Prior to 1872 there had been for some years a general feeling of dissatisfaction that the constant supply progressed but slowly, and that the fire-mains were feebly served. The Works Committee of the Corporation had also been in contest with the Company for several years as to a vexatious mode of charging for water used for street-watering and sanitary purposes. The Corporation were often taunted with want of public spirit in not acquiring the water-works. Having shown what difficulties stood in the way of public authorities doing this 20 years ago, and described the manner in which the undertaking of the Water Company was eventually acquired, Alderman Hallett stated that great extensions took place in the year 1874; and the work was continued until November in that year, when an exceptionally large fissure was opened at the foot of the entrance well, and no further work was admissible for several years. With the best wish to do everything necessary, the Corporation would not have succeeded as they had done in 18 years but for good and energetic advisers. From Mr. E. Easton, C.E. (son of Mr. James Easton), they had had such plans submitted from time to time as had served to keep every part of the great undertaking well up to the mark. By their local Engineer, Mr. John Baker, works of very arduous character had been carefully executed; and he had now the entire responsibility for carrying out the new pumping-station at Patcham. After paying a high tribute to the tunnelling works constructed under Mr. Baker's supervision, Alderman Hallett, referring to financial matters, observed that there is a gradually increasing margin of profit, notwithstanding that the Corporation supply water for street flushing, both

in Brighton and Hove, without any charge whatever. Alluding, in conclusion, to the policy pursued by the Corporation in their management of the water undertaking, he said that during the 18 years in which it had been in their hands, there had never been an occasion on which opposition had been raised to further outlay. The water supply was one that every inhabitant desired to be the very best possible. The policy of the Corporation, shortly stated, was to maintain and improve the efficiency of the plant and mains; to supply outlying districts as readily as, and even more readily than a private company would do; to urge the substitution of constant for intermittent services; to give good pressure fire-mains, and to supply water freely for the effective flushing of all drains without charge. In such ways, although the money profit at the end of the financial year was less, the benefit to the inhabitants through improved sanitary conditions was felt to be by far more advantageous to the well-being and reputation of the great health resort, in which the Institute had met.

In the discussion on the paper, Mr. Baldwin Latham asked if any survey of the underground water district of Brighton had been made, or if the area and direction of flow had been actually ascertained; also what was the population. He said that in many towns the water-works had been constructed without regard to the population; and in several cases there had been failures. Still, speaking upon the supply of water and the quantity to be obtained, he remarked that, if they wished to know the sanitary state of a district, they should not take the general mortality, but take the mortality of children under five years of age. If they arrived at the quantity of underground water flowing, they would ascertain that just as the water varied, so the death-rate fluctuated. The lower the water, the higher the death-rate. The Corporation of Brighton were to be commended for having taken over the water-works and getting control of the public supply; but he should say it was unfortunate for any town to have two services—intermittent and constant. On no consideration would he allow an intermittent supply. When the works were in the hands of a corporation, he did not see any difficulty in abolishing the intermittent supply. The constant was more economical than the intermittent system, as less water was used under it, and fewer turncocks had to be employed. He thought Brighton was very fortunate in having its water reservoirs close to the town. Alderman Hallett, in reply, said he did not know if the area of the supply of water to Brighton had been surveyed; but Mr. Easton told them that the Dyke Hill and all the Downs were contributing towards it. Under the ground they had recently acquired at Patcham, they had found an enormous store of water. They had tunnelled about 3000 feet at Goldstone, and could go as far as they pleased; but now they were simply overdone with water. For the past four weeks they had been pumping day and night, and throwing out double the supply required for Brighton, in order to clear the tunnels for the visit of the Institute. Two engines of 150-horse power each had been throwing out 7 million gallons a day. They had taken land at Patcham in case they wanted more water in years to come; but the supply at Goldstone now was such that, if the engines stood still for six hours, the whole place would be full of water.

Water-Works Regulations.

A paper on this subject had been prepared by Mr. R. E. Middleton; but, in his absence, it was read by one of the Honorary Secretaries (Mr. E. C. Robins). The author quoted the regulations in use by the Liverpool Corporation as being perhaps as complete and simple as any; and, commenting upon them, said it seemed most desirable, in the interest of the consumer as well as that of the supplier, that only reliable plumbers should be employed. If a company had power to make regulations as to the supply of water, and to refuse to afford such supply unless certain conditions were complied with, one of these might reasonably be that only plumbers who agreed to work in accordance with certain regulations, and who would be responsible for the excellence of their work, should be employed. In the majority of cases such exclusive employment was not insisted on, though strongly recommended. The testing and stamping of fittings was by no means a universal requirement. In certain cases it was stipulated that the valves and the apparatus should be approved by the company; but in others no stipulation whatever was made on this head. Lead pipes were required by the majority of companies, and in a few instances these were specified to be tinned. The depth of service-pipes varied in different places from 1 ft. 6 in. to 3 ft. The smallest lead service-pipe permitted was ¾ inch diameter. The requirement that every cistern should be in an accessible position, and made capable of easy inspection, could be easily complied with; but when it was stated that every cistern must be securely covered, and be easy of inspection, some explanation was necessary. In one or two cases this was stated to mean that a good cover must be fitted to every cistern, and a small door provided in it by which access could be obtained to the ball-cock. It was obvious that such an arrangement made it extremely difficult to clean the cistern, or to see that it required cleaning. Mr. Middleton concluded by quoting from the regulations of the Chelsea Water Company, and of the Manchester Corporation Water Committee; and suggested that it would be advantageous if all regulations could be assimilated thereto, with such slight modifications as were necessitated by local requirements.

In the discussion on the paper, Mr. Rogers Field spoke in favour of the occasional relaxation of regulations requiring that only lead pipes should be laid in houses. Mr. Baldwin Latham stated that regulations were necessary to ensure a proper supply of water to the people; and they might be introduced without restricting the delivery. He knew a town in which the people had 40 gallons of water per head per day, and were not satisfied; and now, after the adoption of regulations to prevent waste, they had 13 gallons, and were perfectly satisfied. He also remarked that there could be no objection to using iron pipes above ground.

In Section III. (Chemistry, Meteorology, and Geology), the proceedings in which were very briefly noticed last week, the President—Mr. W. Topley, F.R.S., F.G.S.—took for the subject of his Inaugural Address "Geology in its Relation to Hygiene as illustrated by the Geology of Sussex." The main facts he dealt with were population, water supply, and the distribution of certain diseases. The coast towns of Sussex, he pointed out, had an abundant supply of pure water beneath them. The upper greensand, he said, had also a very large population in proportion to its small surface area; this being due to the dryness and fertility of the soil, and to the excellent water supply, which was easily obtained. The upper and lower divisions of the lower greensand also afforded dry sites; and water in springs was at no great depth. In the Wealden district, however, the problem of obtaining an efficient supply of water was often one of very great difficulty. Attention was drawn by Mr. Topley to the fact that the population of many villages was not increasing, and that for those which had to some extent developed of late years, the natural water supply from springs, streams, and shallow wells would still suffice. But cesspools had hopelessly poisoned the wells and springs, and systematic sewerage had fouled the streams. No one well acquainted with the condition of rural England could doubt that a large part of the sanitary work of the present day consisted in merely combating the evil effects of ill-considered measures in the past.

A paper by Mr. F. E. Sawyer, F.S.A., entitled "The Climate of Brighton," elicited some remarks on the effect of hard water upon health. The President of the Congress (Sir I. Crawford) said he had noticed in another district, where the water was harder than at Brighton, the freedom of the children from disease, and of the people generally from those forms of dyspepsia so common among luxurious people like the English. Mr. Baldwin Latham said, with regard to the softening of water, there was no doubt that for domestic purposes it was desirable that water should be softened; but statistical information showed that moderately hard water was the healthiest. As was well known, it was only extremely soft water that was liable to take up lead poison as it passed through the pipes.

Dr. A. W. Scatliff read a paper upon "A Case of Well Pollution Undetected by Chemical Analysis." He mentioned a case in which enteric fever was derived from drinking the water of a well, on the water of which the Public Analyst reported that, though of doubtful purity, it was not, in his opinion, a safe case to take into Court. Careful investigation seemed to show that the well had become contaminated by specific enteric poison. These cases, he thought, showed that it was unsafe to trust to the chemical examination of water, unless they had persuaded themselves that the source was free from pollution. In the course of the discussion, Mr. Baldwin Latham said that in most instances in which typhoid fever had been traced, the water had passed analysis. His own opinion was that wells liable to contamination, even to the smallest extent, were to be looked upon with very great suspicion. They could trace water a long way underground, and thus discover if it went anywhere near a source of pollution. They must not trust to organic chemistry to tell them whether or not water was wholesome; but must use their own good common sense, and take care not to drink water if near a cesspool or any other contaminating source.

A paper by Dr. Percy Frankland, B.Sc., F.C.S., on "Lead-Poisoning from Soft Water Supplies," was taken as read. The author said no doubt water analysts in general devoted too little attention to the question of the lead-dissolving power of the water submitted to them for opinion. Hard waters were generally considered above suspicion, though cases were by no means unknown of hard waters, generally from polluted shallow wells, which had a powerful action on lead. On the other hand, all soft waters must be provisionally viewed with suspicion. It was of the greatest importance to remember that the activity of water from the same source was extremely variable at different times and seasons. For the prevention of lead-poisoning, it had been frequently recommended to pass the water, before entering lead pipes, through filters of chalk or limestone, with a view of correcting acidity. He had found filters of sand, flint, and limestone fairly successful in this case; the assumption being that the presence of silica was essential to securing the inactivity of the water. But by far the most efficacious method was the adoption of carbonate of soda.

The Bridgetown (Barbados) Water-Works Company.—The revenue account of this Company for the half year ending June 30 last will bear favourable comparison with previous half years. The total receipts were £6567; and the expenditure £1513—thus leaving as profit £5054. The balance on the profit and loss account, including the unexpended sum of £1772 from the previous half year, was £5405; and from this a dividend was declared, at the meeting on the 14th ult., at the rate of 8 per cent. per annum on the original and "A" preference shares, and 6 per cent. on the "B" preference shares. New works, including a reservoir, which the Company have been constructing at Bowmanston, are fast approaching completion.

The Clonmel Water and Sewerage Works.—The Town Council of Clonmel lately advertised two separate open competitions for the best schemes for the water and sewerage works of the town. A London engineer was engaged as assessor; and, acting on his advice, the Committee have, it is stated, unanimously adopted the schemes submitted by Mr. W. H. Radford, of Nottingham. The Town Council have decided to carry out the water-works at once under Mr. Radford's superintendence. In this scheme he proposes to bring the water by gravitation from a mountain stream at Glenmorgan, having a watershed of 1700 acres; the intake being situate about three miles from the town. Filter-beds and a covered service reservoir to hold two days' supply will be situate on a hill near the town; the pressure being sufficient to command the roof of the highest building when the consumption is at the maximum. The gravitation main will deliver 548,640 gallons a day at the service reservoir. Water-mains, with the usual fittings, will be laid in every street. The population to be supplied is 12,000; and the estimated cost of the engineering works is £11,000. In the sewerage scheme, Mr. Radford proposes to lay new pipe-sewers in every street; the sewage being brought down to the outfall works by gravitation. The present sewers are to be used to convey the street surface water into the river. At the outfall works the sewage will be raised by duplicate gas-engines and centrifugal pumps, and treated in tanks by chemical precipitation followed by filtration; the effluent being conveyed to the River Suir. There is a tank under the engine-house for storing the night sewage. Arrangements will be made for flushing, inspection, ventilation, and storm overflow. The estimated cost of the engineering works is £8000.

THE PADIHAM LOCAL BOARD NEW WATER-WORKS.

Mr. John Gregson, the Surveyor to the Padiham Local Board, has issued a descriptive account of the water-works now in progress at Churn Clough. It appears that the Local Board in 1882 obtained an Act of Parliament giving them power to construct the reservoir; and the contract was let to Messrs. Cooper and Tullis on Sept. 18, 1884, for £29,517. The first sod was cut on Sept. 15. The Churn Clough watershed has an area of 253 acres; and the Stainscombe watershed, an area of 187 acres. The embankment of the reservoir is about 490 yards long; and the greatest width about 500 feet. The width at the top water level is 45 feet; and the finished level 15 feet. The cubical contents of the embankment is about 249,000 yards, of which 245,000 yards is in position. The average depth of the puddle trench from the finished surface is something like 70 feet; and the greatest depth of puddle is 138 feet. The amount of puddle at present in the trench is 44,500 cubic yards; and the amount required to complete it is 1400 cubic yards. The average depth of the reservoir from high-water line is 26 ft. 6 in.; and it has a capacity of 115 million gallons, and when full will have a water surface of 15½ acres. The culvert through the embankment is of 18-inch brickwork, with concrete lining outside. It is 5 feet in diameter internally, and 370 feet long; and within it, on iron chairs, is a pipe 24 inches in diameter for the town's supply. On the 10th of July, 1885, water from the springs at Churn Clough was sent into Padiham. The tunnel through Black Hill is 400 yards long and 80 feet deep from the crown of the hill; and the cost of the pipe-line was £4744. The embankment will be carried to its full height in a few weeks. The top part will be faced with stones after that time; and the reservoir will be ready to receive water early in November. The reservoir to be made at Stainscombe will have a capacity of 14 million gallons.

LEAD POISONING FROM DRINKING WATER.

A Discussion before the British Medical Association.

The Annual Meeting of the British Medical Association was held in Birmingham recently; and, in the course of the proceedings on the occasion, Dr. THEODORE THOMSON, Medical Officer of Health for Sheffield, read a paper on "Lead Poisoning from Drinking Water." Dr. Alfred Hill, the President of the Public Medicine Section, presided. The paper was illustrated by a large map of the high and low level gathering-grounds and the corresponding districts of water supply for the Sheffield Water-Works.

Dr. THOMSON, in his paper, said that in considering the etiology of lead poisoning, one was struck by the number of conditions advanced as causes, by the absolutely contradictory experiments by capable observers; and by the certainty of opinion, notwithstanding opposing evidence by others, entertained by some of these observers, that they had discovered the true cause. He proceeded to touch shortly upon the principal theories advanced, and upon the evidence *pro* and *con.* in respect of some of them. The question of contained gases in the water at Sheffield had not, he said, been much gone into. The Borough Analyst had performed for him a few analyses, on which, however, he made the comment that, to be satisfactory, the analysis should be done on the spot at the moment the sample was taken, because oxygen acted rapidly upon some kinds of organic matter. One alleged cause had been recently advanced, associated with the names of Messrs. Crookes, Odling, and Tidy; and that was a deficiency of silica. On this, which had been suggested as explanatory of the action of the Sheffield high-level water, he (Dr. Thomson) did not make any statement, but simply pointed to it as a recent view advanced by able men, which was not in accordance with other views on the same subject. Another suggested cause of lead poisoning was that during the last twelve or eighteen years an alteration had taken place in the quality of the lead piping. Mr. Eaton, the Water Engineer of the Sheffield Corporation, had drawn attention to the fact that Spanish lead was the article from which lead piping was now largely made; instead, as used to be the case, British lead. Spanish lead was a pure lead; whereas the British was an alloy of lead and silver, and was, it was stated, not so readily taken up in solution by water as was the Spanish lead. This was, however, probably advanced as a contributory cause; for it would appear that the power of Sheffield water to take up lead was known as long ago as 1854. Lastly, there was a suggestion, made by Mr. Power in the supplement to the seventeenth annual report of the Local Government Board, that the plumbo-solvent action of certain moorland waters might be related to the agency (direct or indirect) of low forms of organic life. So far, however, nothing very definite had been found in the line indicated. Turning to the remedial treatment of plumbo-solvent waters, Dr. Thomson said the recommendations were as multitudinous as were the etiological suggestions. Domestic filtration he regarded as bad in principle; as, apart from any question of expense, the majority of people would not take the trouble to filter their tap-water. Nor did he for a moment think that the substitution of other pipes, or any internal coating of lead pipes, was to be commended except as a last resort. It implied the taking up of thousands of miles of piping and laying down something which did not possess the durability, flexibility, and cheapness of lead. The true indication, to his thinking, was in the direction of so treating the water before delivery as to reduce its plumbo-solvent action within limits not detrimental to health. In concluding his paper, the author said that at Sheffield chalk was now being added to the high-level water, for the purpose above mentioned; and he gave a brief sketch of the treatment, with a statement of the results so far attained. Before the treatment with chalk began, water was drawn from the communication-pipes of the high-level district—water which had been allowed to stand in the pipes several hours. The average amount of lead in solution in these waters was 0·34 grain per gallon. Since the addition of chalk it had been found to be uniformly 0·11 grain per gallon, or a reduction of one-third of the amount taken up before the treatment.

Dr. S. COPEMAN (London), in the discussion which followed, said that he had been appointed by the Association as their Special Commissioner to investigate the subject of lead poisoning. He went to Sheffield; and when he got there he speedily found that it was no alarmist cry with regard to lead poisoning, for he speedily collected more than a thousand authentic cases. In addition to these cases, he made a kind of house-to-house visitation in one of the streets of the poorer neighbourhoods, where it was known that there was a dispensary patient living. He saw the patient, and found also that all the persons in the house had had the well-known lead line on the teeth, and inside of their cheeks large patches. In three or four other houses they had similar experiences. Most of these people had never seen a medical man; and it was quite likely no one knew they were affected. But nearly all of them had been more or less affected by lead poisoning. With regard to the etiology of lead poisoning, he had not as yet been able to do much; but he had had some samples of the water sent to the laboratory, and certainly some of them were distinctly acid. He had authority for stating that the Local Government Board would in all probability shortly take up the matter. They were quite conscious that there was a grave danger existing to some of the people in certain parts of the country.

Dr. THURSFIELD said that the qualities of the water appeared to have been inquired into a good deal; but the effect of different qualities of lead did not seem to have received so much attention. He had been told of some lead piping at a place where the water was very likely to act upon the lead; and it was said the pipes were made in the time of the Romans. Perhaps that was going too far back; but anyway they were very old, and had not been acted upon by the water passing over them for ages. A large manufacturer had told him that piping was pressed out of lead by hydraulic pressure; and it was scarcely ever made from virgin lead. But if a manufacturer received an order for chemical works, he made "chemical" lead—never mixed with any alloy. It struck him (Dr. Thursfield) that if this lead was suitable for chemical manufacturers, surely it would be much more suitable for the manufacture of lead piping. Of course the expense might be considerably increased.

Dr. PORTER (Sheffield) thought the question of the quality of the lead an important one. Dr. Thomson had alluded to the fact that Sheffield water was known many years ago to act on lead; and he (the speaker) saw that, from a paper, 40 years ago the question was before the Corporation of Sheffield. He had been collecting cases of lead poisoning in Sheffield for ten years; and often saw cases caused by the occupations the people followed. But it was not until 1884 that his attention was drawn to the action of the water. Since 1884 he had seen many cases where the only source of poisoning that could be detected was the water supply. He had always eliminated trade cases; and he had probably thus passed over many instances in which the patients worked among lead, but might also be contracting the disease from the water as well. The question of lead piping rather fell in, he thought, with the epidemic character of the cases. The districts in which he had met with the largest number of cases were chiefly new districts, where the houses were more or less modern, and probably fitted with modern lead piping. He had seen cases in old houses; but the bulk of them, he believed, occurred in property which was new.

The PRESIDENT thought the lined piping, which it was suggested to lay down at Sheffield, would be rather difficult to be used in the matter of bends. With regard to the lead pipes, they knew how differently lead was affected by different kinds of water; and he was rather surprised that no reference had been made to any other material for pipes—why iron should not be substituted for lead. It might be objected that the iron pipes were apt to rust. It was true that they were, where the water contained nitrates; but he did not know that pure soft waters were disposed to act upon iron, and produce oxides. It seemed to him that the adoption of iron pipes might meet the difficulty. With regard to Government interference and making a truly exhaustive and scientific inquiry, every member must feel that such an inquiry was advisable, rather than one undertaken by private persons. He concluded by moving a resolution expressing the opinion of the meeting that it was very desirable the Government should make an inquiry into the subject of lead poisoning.

Dr. PARKES seconded the motion, which was carried.

Dr. THOMSON replied on the discussion, and said it was highly desirable that they should have such an inquiry as the resolution indicated. He pointed out that the question of the lead had received some attention in Sheffield; and he said it would be a very serious matter to take up thousands of miles of pipes. Iron piping would not be so convenient as lead for working purposes.

Liverpool Corporation Water Supply.—From a statement presented at the meeting of the Liverpool Corporation Water Committee yesterday week, it appeared that the Water Engineer had reported to the Executive Sub-Committee as follows: "The consumption of water under the restricted distribution of the last four weeks has been less by about one million gallons per day than the quantity that would have been required to give a constant supply during the same period; and by the saving thus effected, the service reservoirs in the city have been filled, and the stock at Prescot, which was previously falling, is now equal to three days' supply from Rivington. The Prescot reservoirs are still only slightly more than half full; and the Committee cannot, without a large reserve there, ensure a full supply to the city in the event of an accident on the pipe-line. But I think it better to incur the risk of some additional temporary curtailment during a possible stoppage in the delivery from Rivington than to continue the present intermittent service one day longer than is necessary to pass through the emergency in which recourse was had to a restricted supply at the beginning of this month [August]. I have therefore to recommend that the ordinary constant supply be resumed." Upon this report the Sub-Committee had decided to restore the usual service; and their action was approved by the Water Committee.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

Contemporaneous with the rise in the price of gas in Edinburgh from 3s. 6d. to 3s. 9d. per 1000 cubic feet, the gas Commissioners have advanced the charge for gas used in the public lamps from 2s. 6d. to 2s. 9d. per 1000 cubic feet. When the resolution was reported to the Town Council, Bailie Steel said that last year, on the faith of a notice that the gas was to be reduced in price, they put larger burners into the lamps; and this increase in the price would make a material difference in the cost of lighting the city. They would have to consider whether they should not go back to the smaller burners; because he did not think the present ones gave a fair amount of light for the quantity of gas consumed. The amount of the "material difference" which was feared by Bailie Steel, is no more than £1030. The Cleaning and Lighting Committee of the Town Council on Tuesday adjusted the estimate for the lighting of the city for the current year, fixing it at £15,650, as against £14,620 estimated last year. The actual expenditure last year was £14,029. A good deal of the increase this year is attributable to the higher wages paid to the lamplighters. On the same day the Committee appointed a deputation to meet the Gas Commissioners with reference to their proposal to raise the price.

As the outcome, no doubt, of the attention which was called to the quantity of gas consumed in the Dundee Gas-Works, a considerable reduction has been effected. During the months of May, June, and July, the quantity consumed was 849,600 cubic feet, a reduction, when compared with the same period of last year, of 109,100 cubic feet. At the same time it is satisfactory to know that the consumption of gas in the city continues to increase, having been, in the past four months, 9,656,400 cubic feet more than in the corresponding four months of last year. At the monthly meeting of the Gas Commission on Wednesday, this increase led one of the members to remark that, with a steadily increasing consumption of gas, they were apt to remain quiescent in regard to electric lighting. There were, he said, at present a score of public works lighted by electricity, which showed that they had the genius within their own community to do the work; and he hoped they would not delay in providing the city with the new light. A letter from the Electric Installation and Maintenance Company, Limited, tendering its services for the construction and maintenance of electric lighting works in Dundee, was allowed to lie on the table, probably till it is seen whether other offers come in.

The Grangemouth Gas Company, instituted as a private co-partnery in 1834 and 1835, has been converted into a limited liability company, with a capital of £10,000, divided into 1000 shares of £10 each.

The proposal to procure an addition to the water supply of Edinburgh and Leith is taking practical shape. At a meeting on Thursday of the Works Committee, to whom it had been remitted to consider and report as to which of the proposed schemes should be adopted, Mr. Hill, C.E., Engineer to the Manchester Corporation, and Mr. Gale, C.E., Engineer to the Glasgow Corporation, were, on the motion of Bailie Archibald, Leith, appointed to report upon the following: (1) The capabilities of the existing undertaking of the Trustees, having regard to the possible recurrence of a dry period, such as that of 1869 to 1871; (2) the existing requirements of the whole community served by the Trustees, keeping in view the almost universal use of w.c.'s, and other important sanitary appliances in Edinburgh and district, and whether any deduction in the quantity per head may be reasonably expected by adopting the best practical means of checking waste; (3) whether the reporters can suggest any more effectual means of checking waste than those in operation at present; (4) the probable future requirements, looking to the large increase in the population, and in the demand for trade purposes, that has taken place since 1870; and (5) assuming that the best practical means are adopted for checking waste, and having regard to the increasing population and rapidly increasing demand for trade purposes, and the time required to mature the scheme and obtain Parliamentary sanction to the same, and for executing all the work, whether the time has come when the Trustees should now take action for bringing in an additional supply of water, and, if so, to report, along with the engineers to the Trust, which of the schemes referred to in the report of the Works Committee should be adopted, looking to the quality and quantity of the water to be obtained, the relative cost, and the probability of their receiving the sanction of Parliament.

On the 26th ult., I mentioned that there had been litigation over a charge by the Musselburgh and Dalkeith Water Trustees for water supplied by meter—the consumer maintaining that the reading of the meter was incorrect—but that the Court upheld the meter. Some interesting figures with reference to erratic readings by meters belonging to the Trustees were given at a meeting of the Musselburgh School Board on Thursday night. The Trustees' account for water consumed at Fisherrow School for the six months from November to May was £11 18s., the meter having registered 238,000 gallons. For the corresponding period of the previous year the charge was only 6s.; and the School Board at first refused to pay the increased charge. But on the meter having been tested and certified to be correct, they paid the sum asked under protest. At the same time the School Board fitted an independent meter upon the service-pipe; and the clerk intimated that the readings of the two meters had been widely different. Their own meter for three weeks registered 230, 260, and 650 gallons respectively; while the readings of the Trustees' meter for two of these weeks were 800 and 5380 gallons respectively. A meter belonging to the Trustees upon another school only registered 10 gallons in five weeks, and the Trustees are going to remove it. At another school, the Trustees' meter for one week indicated 100 gallons, and for the succeeding week 1000 gallons. The Chairman thought the explanation must be that the meters registered correctly to a certain point; but that then the indicator went wrong and registered a great deal more than had passed. The subject was continued; but the state of affairs is unsatisfactory, and will most likely be heard of again.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

A somewhat interesting bit of gas news has come to me in connection with the monthly meeting of a country School Board—that of the parish of Old Kilpatrick, in Dumbartonshire. At that meeting, which was held on Thursday, the Clerk submitted a letter from the Glasgow Corporation, which stated that they proposed laying gas-mains in the vicinity of Clydebank Public School, and would, if desired, have a connection for the school. The price of their gas was 2s. 6d. per 1000 cubic feet. A letter was also read at the same meeting from the Partick, Hillhead, and Maryhill Gas Company, into whose hands the works and plant of the Old Kilpatrick Gas Company, from whom the school had its supply of gas, had passed. The said letter stated that the Company first named had agreed to supply the school with gas at the same price as that charged for the Glasgow Corporation gas. It is stated that the Clerk was instructed to write saying that the Board would continue to take their supply of gas from the Partick, Hillhead, and Maryhill Gas Company on the terms mentioned, provided that the quality of the gas was as good as that supplied by the Glasgow Corporation. This simple incident abundantly shows that there is at present existing a keen competitive spirit on the part of both of these gas-supply concerns, and that the policy of canvassing, or "touting," for business has now begun in earnest.

Another phase of the question of the Glasgow Gas Trust *v.* Partick, Hillhead, and Maryhill Gas Company came up at Thursday's meeting of the Glasgow Corporation. It was stated in the minutes that a conference had been held between certain members of the Gas Committee (Special Sub-Committee) and a deputation from the Directors of the Partick, Hillhead, and Maryhill Gas Company, consisting of Mr. Henry Cowan (Chairman), two of the Directors, and Mr. Graham, Secretary of the Company. The minutes of the proceedings of the conference stated that, after a preliminary conversation, Mr. Cowan, on behalf of the deputation, explained that the object which they had in view in asking a conference with representatives of the Gas Trust was to ascertain whether the Corporation would be disposed to enter into renewed negotiations for the acquisition of the Company's undertaking. On behalf of the Special Sub-Committee, it was stated by the Chairman (Mr. Ure) that they had no authority whatever to enter into the negotiations referred to, but that the object of the deputation in asking for the conference would be reported to the Gas Committee. In due course (on the 28th ult.) the minute of the conference was reported to the Gas Committee and approved of; and, with reference thereto, it was resolved to recommend that the Town Council should authorize the Gas Committee to open up negotiations with the Directors of the Gas Company in regard to the sale of their undertaking to the Corporation. When moving the adoption of the Gas Committee's minutes, at Thursday's Town Council meeting, Mr. Ure said that they were not very enthusiastic about the matter; but if it was the will of the Town Council that the Committee should negotiate with the parties, he could assure them that no bargain would be agreed to that they did not believe to be of advantage to the citizens of Glasgow. On a former occasion they had arranged with the Gas Trust and the Directors of the Gas Company the price to be paid; and they had really purchased the concern, subject to the consent of the shareholders of the Company. He would not agree, on the next occasion, to let the shareholders of the Gas Company have the last word in the transaction. In the event of an agreement being arrived at between the Directors of the Company and the Gas Committee, he would then have the Directors to submit it to their shareholders prior to bringing it before the Town Council, who would have the last word—either to reject or accept it. He did not think they should again place themselves in the humiliating position of agreeing to a certain arrangement and having it rejected by any body of shareholders. The motion for the adoption of the minutes was seconded by Mr. M'Laren; and then Mr. Gray demurred to the proposal of the Gas Committee, and moved that in the meantime negotiations be not opened with the Directors of the Gas Company. This amendment having also been seconded, Sir James Marwick (Town Clerk) suggested that the Committee's recommendation might be altered to read as follows: "Authorize the Gas Committee to receive any proposals which may be submitted by the Directors of the Company, and to negotiate with them in regard to the sale of their undertaking to the Corporation." Under those circumstances, no action would be taken until they had got from the Gas Company a specific proposal on their part. Having obtained the proposal, they would then be in a position to negotiate with them, and bring up the matter in the usual manner before the Council. Bailie Paton expressed his sympathy with the position taken up by Mr. Gray; but he was not quite certain that it would be wise to depart from the recommendation of the Committee. He thought that the terms previously offered were ridiculously high; indeed, he was satisfied that the Partick, Hillhead, and Maryhill Gas Company could not live under the competition of the Glasgow Corporation. If negotiations were to be entered into, it must be clearly understood that they began *de novo*, and that the last offer was not to form the basis of the new negotiations. After some remarks by Bailie James Martin and the Chairman (Bailie Mitchell), Mr. Ure said that statements had been made by members of the Council which indicated that they did not wish the works in question on any terms; and he wished it made clear whether negotiations should be proceeded with or not. Mr. Simons was of opinion that they would make an egregious blunder if they did not adhere to the minute. The question of the gas-works was, he said, intimately bound up with the question of annexation; and for that reason, if for no other, the Committee should get the power which they asked. With regard to a statement made by Mr. Gray, to the effect that they did not require the works in question, he said that he had the authority of Mr. Foulis for stating that the works would be an acquisition to the Corporation. He also remarked that they were safe in accepting the minutes, as the Committee would do nothing rash. After some further discussion, the recommendation of the Gas Committee, as amended by the Town Clerk, was adopted.

At the same meeting of the Town Council there was also considered a report from the Special Sub-Committee on Electric Lighting which showed that the Town Clerk had brought under their notice the fact of the "Glasgow Corporation Electric Lighting Order, 1890," having received the Royal Assent. Certain letters had been brought before the Sub-Committee relative to the carrying out of the powers conferred on the Lord Provost, Magistrates, and Town Council by the

Provisional Order. After deliberation, the Sub-Committee resolved to recommend that a remit should be made by the Town Council to the Gas Committee to consider, under such professional guidance as they might think necessary or expedient, the whole subject of carrying into effect the powers contained in the Corporation Order, as well as the several matters referred to in the letters which had been submitted to them, and to report thereon to the Town Council. Mr. Ure made a short explanatory statement in submitting the Committee's recommendation, which was agreed to.

The Glasgow pig iron warrant market has been flat this week. On Monday Scotch iron was sold at 50s. 3d. per ton, and on Wednesday, the price was down to 48s. 9½d.; the close yesterday being 49s. cash buyers.

A very firm tone has prevailed during the week in the local coal trade. There has been large shipments, and prices are tending upwards all round; indeed, there has been a general advance in the price of house coal to the extent of 1s. per ton.

A report of the local sulphate of ammonia trade for the past week states that the market has been quiet, but prices have been well maintained. Business has been done at £11 12s. 6d., usual terms, f.o.b. Leith for prompt delivery; but there are few sellers at this figure. For October to March deliveries £11 15s., usual terms, f.o.b. Leith, has been obtained on several hands. There is little demand from the Continent as yet.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 6.

Sulphate of Ammonia.—There has been a quieter tone generally; but there is barely any change in values. The fact is that while stocks remain low, and the production is small, the available quantities are readily absorbed by the steady demand; and although American orders show some falling off, they still keep coming in for moderate quantities. While, therefore, there is no change in the quotations here and at Hull, the Leith market is reported weaker, with sellers at £11 12s. 6d. But a better feeling may be expected to prevail as we get further into the month. Nitrate keeps firm; and the position of this market is generally improved. The visible supply at the present moment is about 30,000 tons less than at the same time last year. The spot price is 8s. 6d.; Spring delivery, 8s. 10½d.

LONDON, *Sept.* 6.

Sulphate of Ammonia.—Owing to a number of second-hand Beckton parcels coming into the market at comparatively low rates, the price has receded somewhat; and to-day's value may be taken as £11 10s. to £11 12s. 6d. Considerable business is reported as having been done during the week at the first-named figure.

Tar Products.—The benzole market has now become steadier; and last week's prices may be taken as to-day's values. Anthracene and pitch are distinctly firmer; and with regard to the latter article, it would seem as though at least last season's best prices would shortly be seen. The f.o.b. value for London is now 30s. per ton. Creosote is in better demand; and ordinary London makes are fetching 13¼d. per gallon. Carbolic is quiet, at 1s. 9d. per gallon.

The Manufacture of Sulphate of Ammonia in Gas-Works. The Barrow Town Council has adopted a recommendation of the Gas Committee to purchase a sulphate of ammonia plant capable of manufacturing 140 tons of sulphate per year. The sum for the purpose was £950. The Lytham Improvement Commissioners last Thursday gave their Gas Committee power to inspect the sulphate plant at the Preston Gas-Works, with a view to the adoption of the process at Lytham. The saving is estimated at £100 per annum.

The Dangers of Electric Lighting.—A fatal accident, due to electricity, occurred on the 31st ult. at Wheeling, West Virginia. Two men stepped upon a wire connected with a powerful dynamo, and fell dead on the spot. People ran to raise them, and two men who were lifting the bodies from the wire sustained severe electric shocks. A fatal electric light accident occurred at Cincinnati on the previous day. A lineman employed by the Electric Light Company of that city inadvertently grasped a live wire, and was instantly killed. It was found that the unfortunate man's hand had been almost burned off. The Detroit Electric Light and Power Company have recognized the dangers of electric lighting, inasmuch as they have adopted a plan of insuring their employees, every one of whom is provided with a £1000 policy, the premiums upon which are paid by the Company so long as he is in their service. The arrangement insures the employees family in case of accidents, and protects the Company from actions for damages.

The Ystrad Water Company Summoned.—At the Ystrad Police Court on a recent occasion, the Ystrad Water Company were summoned for supplying impure water. Mr. Rhys, instructed by the Ystrad Local Board, appeared for the complainant, named Palmer, residing at Ton; and he stated that this was the second time the Company had been brought before the Court. On the previous occasion the charge against them was deficiency of supply; but they were now charged with supplying contaminated water. On July 15 the complainant drew a bucket of water, which contained parts of a frog, spawn, earth worms, and other creatures. Mr. A. Lewis, Counsel for the Company, said that before his friend went further, he had a preliminary objection to make. In order to prosecute, it was essential, according to the Act of Parliament, that the complainant should have paid his water-rate for the quarter in advance. In this case it had not been done, neither had he tendered the amount; and therefore he was not in a position to lay an information, or to put the penal clause in motion. Mr. Rhys said he expected the objection would be raised; but he did not think it applied in this instance. Palmer did not pay his rates direct, but through his landlord, who charged them in his rent. The amount had been tendered; but the Company's servants had raised excuses for not taking it—no doubt on purpose. His Worship said he considered the objection was fatal; and if he were to convict, the conviction would certainly be set aside. The better plan would be to find a prosecutor who had paid his rates. The summons was thereupon dismissed.

Gas and Electric Lighting Affairs at Dublin.—It is announced that Mr. C. P. Cotton, C.E., one of the Local Government Board Inspectors, will hold an inquiry at Dublin on the 12th inst., in reference to an application made by the Corporation to the Board for their sanction to the borrowing of £63,000, of which £50,000 is required for the purposes of carrying out an installation under the Electric Lighting Act; and £3000 for the purchase of ground and erection of buildings for gas and meter testing offices—the balance being required for certain city improvements.

The Deacon Waste-Detecting Meter at Andover.—The Andover Water Company are among those who have recently recognized the value of the Deacon waste-detecting meter. For some time past the demand for water in Andover had shown signs of outrunning the supply; and the Company in consequence commenced the sinking of a new well to meet their growing wants. Suspicions had been for some time entertained that much of the water supplied was lost by leakage, though this could not be traced; and communications had passed between them and the manufacturers of the Deacon meter. At last it was decided to put down a meter, which was lent for the purpose. The first reading showed a daily supply of 53 gallons per head, and that there was a steady flow throughout the night of 5000 gallons per hour. The next night an analysis of this waste was made by shutting down at intervals the various valves; thus cutting up the supply into twelve sections. One of these, and that a very small one, showed a waste of 3300 gallons per hour, which being thus far located, was readily found next day in the shape of a "blown" joint in a 6-inch main, the water from which was escaping through a broken drain into the river without the slightest sign appearing on the surface. Other discoveries followed, and in the course of a few days the 53 gallons per head per day was brought down to 18 gallons without any interference with the free use of water by consumers. The hours of pumping were reduced from 16 or 17 to 5 or 6; and the outlay on the partially completed new well was found to have been totally unnecessary. The Company at once decided to purchase the meter which had done such good service. Considering that the Palatine Engineering Company, Limited, of Liverpool, who are the manufacturers of the Deacon meter, are willing to lend meters for trial in this manner, and are able also to supply trained inspectors if required, it is remarkable that there should be any water-works in the country that have not at least given a trial to this invention.

A Pennyworth of Gas.—The "slot" system, which has been rendered familiar to most of us by the automatic machines at railway stations and other places, is, says the *Bolton Journal*, now applied to the consumption of gas in domestic dwellings in Bolton. A pennyworth of gas as often as you want it, and no more, is a convenience which will no doubt be appreciated, by the poorer classes, to whom the quarterly recurrence of gas bills is a bugbear, and very often a serious difficulty to encounter. The system has been introduced into Bolton; and though there are not many machines at present in operation—one or two under the dozen—there is no reason why they should not increase. The Gas Committee of the Bolton Corporation estimate that there are in the borough something like 6000 houses in which gas is not consumed, owing possibly to the limited means of the occupants. In these houses recourse is for the most part made to the consumption of oil, it being a comparatively easy matter to obtain a pennyworth of oil for the lamp which supplies the household with light. As our readers are aware, Messers. W. and B. Cowan have produced a machine which supplies to the householder for a penny a quantity of gas equal to 25 cubic feet, which will last five hours when consumed through a single burner. The manufacturers of the meter are Messrs, Sawyer and Purvis, of Manchester. The price at Bolton is normally 3s. 4d. per 1000 cubic feet; but after the discount has been taken off it is 2s. 8d. Under the new system, nothing has to be paid for the hire of the meter, which is 6d. per quarter. One advantage claimed for it is that the danger of lighting by oil-lamps, such as breakage and explosion, is at once obviated, and the consumer is in a position to know at once what he is spending on illuminants. One of the staff of the above-named paper saw the meter at work, and the consumer professed himself as fully satisfied. It had been in operation for more than two months, and it had answered admirably. He characterized it as a great boon to poor people.

The Wigan Corporation Water-Works.—At the invitation of Mr Richards, the Chairman of the Water Committee, a number of members of the Wigan Corporation, with some of the officials, recently paid a visit to the water-works. Since the last formal inspection, considerable improvements have been carried out for the filtration of the water. Some four years ago the water became impure and caused considerable anxiety to the Committee. To remedy the matter, the brooks and watercourses leading to the reservoirs were cleaned out, and steps were taken to keep them free from anything of an injurious character from the bordering farms. Instead of improving, the water became worse; and the Committee decided to construct two more filter-beds, each 100 feet by 50 feet, and also a large iron tank to receive the filtered water. Settling-tanks in the conduit are also being made; and these will intercept a considerable amount of sediment, so that the water will be in a much purer state when it reaches the reservoirs. The cost of the work carried out during the last two or three years has been computed at not less than £7000. The new works were examined with interest; and Mr. Richards and the Water Engineer (Mr. T. L. Hughes) were congratulated on the result. The former gentleman, in the course of a short speech, stated that the space for filtration purposes had been nearly doubled; and instead of sending the water through the filter-beds at a rate of something like 10½ gallons per square foot per hour, they were now able to reduce it to 1½ gallons per square foot per hour—a state of things with which even the Local Government Board would not find fault. By having the large tank, they had ample room for storing the filtered water; and it gave them the power of using the filter-beds at night as well as during the day, with the result that while they could easily meet the demand, the water was far purer than it was some time ago. The additional filter-beds would ensure a safe supply of water for many years to come; and he believed if the population of Wigan increased by 20,000 or 25,000, their filtration space was amply sufficient for that number of inhabitants.

A New Water Reservoir for Elland.—Last Wednesday afternoon a new service reservoir, which has been constructed for the supply of Elland, was "opened" in the presence of the members of the Local Board and a number of the ratepayers. The reservoir is 115 feet long, 100 feet broad, and 17 feet deep, and is capable of containing 500,000 gallons. It has cost about £3000; and the work of construction has been carried out under the superintendence of Mr. G. H. Crowther, C.E., of Huddersfield. A portion of the supply will be obtained from the Halifax Corporation.

The Quality of the Water Supply of Farnham.—The inhabitants of Farnham have recently been alarmed by statements which had been made regarding the purity of the water supplied to them by the local Water Company; and, in order to ascertain whether there were any grounds for fear, the Local Board submitted two samples of the water for analysis to Dr. Stevenson, of Guy's Hospital. A special meeting of the Board was held the other day to receive his report. It stated that one of the samples was free from odour; and when viewed in bulk was of a pale blue colour, and slightly turbid. The second was free from odour; and when viewed in bulk was of a pale green colour, and slightly turbid. In the first sample an earthy deposit had settled; and in the second one, there was a trifling deposit on long standing. The waters were turbid and unsightly; and insufficient care had been taken either in the collection or distribution of the supply. After clarification by simple subsidence, both samples showed a satisfactory degree of freedom from organic impurities; and Dr. Stevenson was of opinion that they might be used with safety for domestic purposes. But in their turbid state they could not be considered satisfactory town supplies. The Board decided that a copy of the report be sent to the Water Company; and that they be urged to take immediate steps to remedy the turbid condition of the water. The Secretary of the Company has since written to the Board, stating that the Directors regretted that the supply had been somewhat discoloured of late; but they were taking steps which it was hoped would prevent further complaint.

Oil v. Gas Lighting at Monmouth.—An animated discussion took place at the meeting of the Monmouth Town Council yesterday week upon a report by a Committee appointed at the previous meeting to inquire into the question of the lighting of the borough. The Committee recommended that, in consequence of the high price charged for gas, and the unsatisfactory supply of light, the whole of the streets be lighted with petroleum lamps, by which a saving of about £200 per annum would be effected, while the illumination would be equally as good. The Mayor (Mr. Hall), in moving the adoption of the report, said he did so as a duty to the ratepayers. The views expressed at their last meeting were before the Gas Company a month; and a letter written them some three weeks ago suggesting an arrangement had not yet been answered, nor had the Company made any attempt to meet the Committee with a view to an agreement. The Clerk stated that the Manager of the Gas Company (Mr. T. Brace) had told him that they would be willing to change the present arrangement of charging £4 per lamp per annum and supply gas by meter at 3s. 6d. per 1000 cubic feet, by which the Council would have absolute control of the gas, and a saving of £150 might be effected. Alderman Hyam and others raised objections to this plan. Mr. Howse suggested that the Company should be invited to send a deputation to meet them at the next meeting; and this was supported by other members. However, after a lengthy discussion, the report was adopted. It was subsequently resolved to adjourn the meeting to Wednesday; and the Clerk was instructed to write in the meantime to the Company offering £3 per lamp per annum, instead of £4 as at present. At Wednesday's meeting a letter was read from the Chairman of the Company (Alderman Baker), offering substantially the same conditions, which were verbally conveyed to the Council through the Clerk at Monday's meeting and rejected—viz., to supply gas by meter at 3s. 6d. per 1000 feet, instead of a yearly charge of £4 per lamp. The general feeling of the members was that this was not a satisfactory reply; and after considerable discussion, the meeting was again adjourned, in order to see whether an amicable agreement could not be come to.

Gas v. Electric Lighting at Lewes.—The Lewes Gas Company having given the Corporation notice that they intend discontinuing their contract for street lighting from Christmas next, "some enterprising individuals" (as Alderman Farncombe termed them at the meeting of the Town Council last Wednesday) have been induced to consider the possibility of lighting the town by electricity. The "enterprising individuals," it appears, are the Gülcher (New) Electric Light and Power Company, Limited; and they have sent in an estimate for lighting based on the following lines: "A complete set of plant and apparatus for 240 16-candle power incandescent lamps will be provided. These lamps may be distributed in any manner desired over 7¼ miles of streets. Incandescent lamps of a higher candle power may be substituted where desired; the total number of lamps being in proportion to the candle power—*i.e.*, a 32-candle power incandescent lamp takes the place of two 16-candle power lamps, a 48 or 50-candle power takes the place of three, and so on. Modification in the incandescent lamps of this kind will not affect the cost of the installation. Arc lamps of 2000-candle power nominal can be supplied to take the place of twelve 16-candle power incandescent lamps; but every such substitution will increase the total cost of the installation by £15." The estimate does not include the supply of lamp-posts; as it is presumed that the present gas-lamp posts will be utilized for the incandescent lamps. According to Alderman Farncombe's statement, it is computed that this scheme can be carried out at a total annual cost of about £600. At present the town is lighted by 219 gas-lamps; and these cost £800 per annum. The Gas Company, however, offered to supply the lamps with gas by meter at 3s. 10d. per 1000 cubic feet, with 5 per cent. discount. This brought the price down to 3s. 7¾d.; and they have intimated that they will make an additional concession of the ¾d. Alderman Farncombe has suggested that they should only charge 3s. 6d. per 1000 feet. He, however, points out that the Corporation would have to incur additional expenditure of about £600 in erecting new standards with a meter in each; and taken altogether, his remarks indicate that he leans very much on the side of electric lighting. The matter is to be further considered by the Highways and Works Committee of the Council, before anything definite is done in regard to it.

The Finances of the Belfast Corporation Gas Committee.—The accounts of the Belfast Corporation Gas Committee for the year ending June 30 last show a net profit of £16,541, after providing the usual sinking fund and allowances for depreciation on meters and stoves. A balance of £3837 was brought forward from last year to the credit of the profit and loss account, which, added to the profit of this year's working, brings up the amount to £20,379. On the recommendation of the Committee, the Corporation have decided that £18,000 of the amount shall be transferred for the reduction of capital account, and the balance be carried forward to the current year's accounts.

Gas Workmen's Excursions.—The annual outing of the employees of the Walton-on-Thames and Weybridge Gas Company took place on Monday last week; the place selected being Boxhill, near Dorking. The men were accompanied by the Engineer (Mr. W. Wood) and the newly appointed Secretary (Mr. S. Potier). The party dined at the Burford Bridge Hotel; and after dinner drove over to Dorking, and went through the gas-works, accompanied by the Engineer (Mr. S. Carpenter). The way was most pleasant and enjoyable. The first excursion of the men employed at the Hull station of the British Gas Company took place on the 30th ult., when upwards of 100 went to Leeds by the Hull and Barnsley Railway, who had placed special carriages at their disposal. After visiting the Exhibition and other objects of interest, all returned home well satisfied with their outing.

The Northern Coal Trade.—The demand for coal during the last few days has been steady. Steam coal still commands about 13s. per ton free on board in the Tyne; but Durham steam is a trifle lower, at about 12s. 6d. per ton—the demand for the latter kind being a little less. Second-class Northumbrian steam coal is barely 12s; and small steam varies from 6s. 6d. to 7s. Gas coals are in full demand; and inquiries are coming along for the local gas companies, who seem disposed to lay in stock. More coal is also being shipped to the Thames; the additional quantity being sufficient to force up the rate of freight by steamer from 3s. 6d. per ton (the summer rate) to 3s. 7½d., with the prospect of a further advance. The contracts for the coal for Stockton have been given out, but the price has not transpired; the general idea being that the cost will be about 11s. 6d. per ton. Most of the large local contracts for coal are now allotted; and deliveries from the collieries are at the higher prices which have ruled for some time. It seems to be the general impression that these high prices for coal will rule for some months; and the decision of the Durham coal trade as to the hours of working of pits will help to maintain the price. Household coal continues very dull, and the consumption low for the season. Bunker coal is also flat. Manufacturing fuel is steady. In coke, the price of best furnace qualities is firmer; 18s. per ton free on board in the Tyne being the ruling quotation. There is no change in the price of gas coke.

The Newark Corporation and the Purchase of the Water-Works.—For some time past negotiations have been proceeding between a Committee authorized by the Newark Town Council to deal with the local water supply and the Directors of the Water Company, with a view to the purchase of the undertaking. It will be remembered the latter applied to Parliament for statutory powers to extend their works, but were opposed by the Corporation and certain maltsters on the ground of the quality and inadequacy of the supply; and the Bill was defeated. There has, however, been a disposition on the part of the public to buy out the shareholders if a price could be agreed upon. The Directors have now offered to sell on the basis of the creation of 10 per cent. annuities on each £10 share. In addition to this, there are liabilities consisting of £7200 of mortgages and £2800 costs, &c., incurred since the promotion of the Bill. These would also have to be taken over by the Town Council if that body fell in with the arrangement. The number of shares in the Company is £1400; and dividing the £10,000 liabilities alluded to above between the shareholders, this leaves about £7 to be apportioned to each. To buy out the annuities, the Corporation would have to borrow money at 3½ per cent. interest, which represents a capitalized payment of £28 per £10 share. There must also be added the £7 liability on each share, which makes the price asked by the Company £35 a share. The Committee of the Town Council have refused to entertain this proposal, and have offered to buy the works at £20 per share, without responsibility for any of these liabilities. It may be mentioned that the price of the shares has been quoted at from £22 to £23; but the last 100 shares offered by auction in Newark were bought in at £17.

Lead-Poisoning in the West Riding.—At a meeting of the Drighlington Local Board last Thursday, a communication was read from Mr. M'Gowen, the Town Clerk of Bradford, in reply to a complaint, by Dr. Forsyth, the Board's Medical Officer, as to the number of cases of lead-poisoning in the district from the use of the Bradford water, and asking the Corporation to provide a remedy. Mr. M'Gowen took objection to the statement that lead-poisoning arose from the use of the Corporation water, and attributed the cause to the want of proper care on the part of the consumers, and possibly from the Board not properly flushing the mains, the same water being used in the borough, and no complaint made; and he asked for information of the names of places where complaints had been made, so that an examination might take place. A letter was read from Dr. Hector, of Drighlington, which stated that, in a period of less than two years, he had treated 86 cases of lead-poisoning in Drighlington and the immediate neighbourhood, and nearly all the people so afflicted lived in houses placed at some distance from main roads, with a considerable length of lead service-pipe connecting them with the mains. He found that absolute abstention from the Bradford water, and the substitution of well or spring water was the only remedy; while a short residence in another district having a different water supply quickly put them all right. The periods during which the poisoning was most prevalent were: (1) From October, 1888, to February, 1889; (2) in December, 1889, and January, 1890; (3) in May, June, and July, 1890. In the spring of last year, much agitation took place about the frequent cases of lead-poisoning in this district; and strong representations were made to the Corporation to take steps to render the water less active in its action on the lead pipes. What steps the Corporation took, Dr. Hector did not know; but the fact remained that in the eight months following the agitation, only one case of lead-poisoning came under his observation.

Shipley and the Water Supply of Windhill.—The Shipley Local Board have entered into a contract to supply the Windhill Local Board's district with water on the termination of their agreement with the Bradford Corporation. The price is to be 8d. per 1000 gallons, against 9d. at present being paid to the Bradford Corporation. By the agreement Shipley will gain an additional income from water of about £800 a year, which, of course, Bradford will lose.

The Strike of Gas Stokers in Melbourne.—A Reuter's telegram from Melbourne on the 30th ult. stated that special protection was being afforded to the gas-works of the city, the stokers in which have struck, as already stated in the JOURNAL. It was expected that gas would be supplied that night. This, however, was done to only a very small extent; the result being that the streets had to be partially lighted by electricity. The Gas Workers' Union have decided to send £1000 in aid of the general labour movement in Melbourne.

Lubricants and Machinery Oils come within the domain of the gas managers; and therefore their attention may be directed to the specialities of Messrs. Donald Macpherson and Co., of Knott Mill, Manchester. This firm's Kylandrolaine—a solidified lubricant—is peculiarly well adapted for engines, shafting, and machines; its use being attended with cleanliness and great economy. The "Foochow Enamel" of the firm is now too well known to need commendation. It has been employed in the decoration of the dining and refreshment rooms at the Edinburgh Exhibition.

Shrewsbury's Heating Appliances.—With the approach of winter, the members of the gas trade are making their usnal preparations for the demand for heating appliances. Mr. G. Shrewsbury, whose place of business is now at No. 36, Gray's Inn Road, is pushing with his "Reliance" hot-water apparatus, which is most serviceable for conservatories, &c. Another patent of Mr. Shrewsbury's is the "Non Pareil" gas conservatory boiler, which is for fixing outside conservatories, potting sheds, &c. Mr. Shrewsbury's patent "Calda," for heating water for baths, has long been known in the market, and has gained a large amount of public approval.

The Closing of the Electric Lighting Station at Cardiff.—The Cardiff Brush Electrical Engineering Company have been distributing among their customers a circular, intimating that they have determined to close for a time, from Oct. 1, their electric light station. They state that it is their intention to considerably extend the capacity of the works; and so soon as they have obtained the consent of the Town Council, to distribute the current by means of underground wires, instead of by overhead wires as heretofore. This decision is explained by the fact that the Board of Trade have requested the Company to forthwith put the overhead circuits into conformity with their new rules and regulations. It is expected by the Company that the Corporation will not refuse their consent to the laying of the wires underground.

Matlock Bath Water Supply.—At the meeting of the Matlock Bath Local Board, last Tuesday, Mr. Rowland drew attention to the inadequacy of the water supply of the district. He said it was an important matter; and as a case of emergency, he moved the appointment of a Special Committee to report on the present condition of the water supply, and to recommend any method of increasing its proportions. Mr. Wheatcroft said he tried all he could to prevent the Board purchasing the water-works, as he knew at the time they would be totally inadequate for Matlock Bath. Five years ago the Board gave £6000 for the plant; and since then they had repaid £1000 of the loan. The water question was really a formidable piece of business; and it would also be a costly one. Mr. Sheppard said the engineer who guaranteed an adequate supply did not know anything at all about it. The Chairman (Mr. Peters) remarked that there were tens of thousands of gallons of water running to waste in the district; and they must see if this could not be utilized. Mr. Rowland said he estimated that the supply could be made efficient for £750. Eventually a Committee was appointed to consider the question.

The Eccup Reservoir of the Leeds Corporation.—At a recent meeting of the Water Committee of the Leeds Corporation, the Town Clerk reported as to an interview he had had with Mr. A. Middleton, Solicitor to Messrs. Gould and Stephenson, respecting the carrying out of their contract at Eccup. The Engineer also reported the result of an interview he had had with Mr. Gould, who stated that he was making every effort to proceed with the work in a more diligent and satisfactory manner. The Committee, on the 26th ult., visited the works now in progress at Eccup, and examined the bottom of the trench, when the Engineer pointed out certain features in connection with the leak. Mr. Gould attended the Committee, and expressed his ability to complete the work within the specified time if huts for the workmen were erected near the works. A resolution was passed permitting the contractors to erect huts on a site to be approved by the Engineer; and the latter was instructed to give 48 hours' notice to the contractor of his intention to employ such workmen, tools, and material as will enable him to complete the contract himself, if within the next few days he is not satisfied with the progress made.

The Effect of Nitrates and Lime in Potable Water.—At the annual conference of the Pharmaceutical Society, held in Leeds last Tuesday, Dr. J. C. Thresh read a paper on the subject of nitrates in drinking water, in the course of which he expressed dissatisfaction with the present methods of testing for them. During the discussion which followed, considerable importance was attached to the presence of nitrates causing disease; and it was pointed out that, while on analysis they were sometimes found to be absent, their presence was frequently discovered. Mr. Strother (London) asked for some information as to the quality of the Leeds water; stating that he had heard that the absence of lime in it acted detrimentally upon the growth of young children. Mr. Reynolds said there was very little lime present; in fact, the water was so wanting in lime as to be one of the most dangerous under some conditions. Some slight action on lead pipes, especially those connected with hot-water systems, might take place with Leeds water. The inhabitants, however, were very well satisfied with it. Mr. F. M. Rimmington (Bradford) said that, in his opinion, the effect of water upon lead pipes greatly depended on its softness.

The Burnley Gas Committee and Inclined Retorts.—At the meeting of the Burnley Town Council last Wednesday, Alderman Collinge reported the recent visit of the Gas Committee to Southall to see the operation of the system of inclined retorts in use there. The Committee made up their minds on two points: (1) that the principle of inclined retorts should be adopted; (2) that the length of the retorts should be 15 feet. This latter decision enabled the Engineers to push on with the gas-works. They were not satisfied as to the manner of charging, and had agreed to watch and wait.

Proposed Purchase of the Selby Gas-Works by the Local Board.—At the meeting of the Selby Local Board last Thursday, the members had under consideration the question of the acquisition of the gas-works. The Gas Committee reported that they had met a deputation from the Directors of the Gas Company, who had made an offer to accept the sum of £20,000 for their undertaking, including buildings and plant, but excepting coal. A Sub-Committee had examined the balance-sheets of the Company from July 31 1883, to June 30 1889; and they found that in that period the Company had expended £1752 on repairs; being an average of £194 per annum. They had also expended the sum of £221 on new mains and services; being a yearly average of £24. In the year ending July 31, 1881, the Company also spent £534 on a new scrubber. These sums had been all paid out of revenue. The average profits from July 31, 1881, to June 30, 1882, had been £1172 per annum. If the Board purchased the undertaking, the Committee were of opinion that it could be done without causing any increase in the rates. But before coming to a final agreement, they strongly recommended the appointment of a competent gas engineer to examine the whole of the plant; and, in the event of such examination being satisfactory, they were unanimously of opinion that it would be to the advantage of the town for the Board to purchase the undertaking. The following resolutions on the subject were eventually come to: "That the Board make a provisional agreement with the Directors for the purchase of the gas-works for the sum named, subject to the approval of the Local Government Board; that the Local Government Board be asked to sanction the same, and allow the Board to borrow money for that purpose; and that a Provisional Order should be applied for in order that the Board could carry on the works.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 538.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Apr.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	"	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107—109	..	4 11 9
100,000	20	30 May	8	Bahia, Limited	20	20—22	..	7 5 5
200,000	5	15 May	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	"	7½	Do. New	4	5—5⅜	..	5 9 1
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	212—217	..	5 12 11
125,000	"		9½	Do. New	100	155—160	..	5 15 7
220,000	20	13 Mar.	11½†	Brighton & Hove Original	20	40—42	..	5 9 6
320,000	20	28 Mar.	11½	British	20	43—45	..	5 0 0
50,000	10	13 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	"	8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	13 June	8	Buenos Ayres (New) Limited	10	12¾—13½	..	5 18 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	103—106	..	5 13 2
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Apr.	13½	Commercial, Old Stock	100	252—257	..	5 7 0
130,000	"	"	10½	Do. New do.	100	200—205	..	5 4 10
130,000	"	27 June	4½	Do. 4½ p. c. Deb. do.	100	117—122	..	3 13 9
557,320	20	13 June	13	Continental Union, Limited	20	48—50	+1	5 4 0
242,680	20	"	13	Do. New '69 & '72	14	33—35	..	5 4 0
200,000	20	"	10	Do. 7 p. c. Pref.	20	39—41	+1	4 17 7
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	195—205	..	4 17 7
234,060	10	16 July	—	European, Limited	10	18—20	..	—
120,000	10	"	—	Do. New	10	18—20	..	—
354,060	10	"	—	Do. do.	7½	14—15	..	—
5,470,620	Stck.	14 Aug.	13	Gaslight & Coke, A, Ordinary	100	236—241	..	5 7 10
100,000	"	"	4	Do. B, 4 p. c. max.	100	98—101	..	3 19 3
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	..	3 18 5
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	119—123	..	4 1 3
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	177—182	..	4 2 5
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	161—166	..	4 4 4
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
1,061,150	"	13 June	4	Do. 4 p. c. Deb. Stk.	100	115—120	..	3 6 8
294,850	"	"	4½	Do. 4½ p. c. do.	100	123—128	..	3 10 4
650,000	"	"	6	Do. 6 p. c. do.	100	163—168	..	3 11 5
3,800,000	Stck.	15 May	12	Imperial Continental	100	220—223	..	5 7 7
75,000	5	13 June	6	Malta & Mediterranean, Ltd.	5	5—5⅛	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	112—114	..	4 7 9
541,920	20	13 June	7½	Monte Video, Limited	20	19—20	..	6 10 0
150,000	5	30 May	10	Oriental, Limited	5	9—9¼	..	5 5 3
60,000	5	28 Mar.	7	Ottoman, Limited	5	5⅛—6	..	5 16 8
166,870	10	16 July	4	Pará Limited	10	3¾—4⅛	..	8 17 9
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
150,000	10	16 Apr.	10	Sax Paulo, Limited	10	14—15	..	6 13 4
500,000	Stck.	28 Aug.	13½	South Metropolitan, A Stock	100	280-285*	..	4 12 11
1,350,000	"	"	11½	Do. B do.	100	226-231*	+1	4 19 6
141,500	"	"	12	Do. C do.	100	235-245*	..	4 17 11
650,000	"	27 June	5	Do. 5 p. c. Deb. Stk.	100	140—145	..	3 9 0
60,000	5	27 Feb.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
						*Ex.div.		
				WATER COMPANIES.				
728,446	Stck.	13 June	9½	Chelsea, Ordinary	100	268—273	+1	3 9 7
1,720,560	Stck.	16 Apr.	7½	East London, Ordinary	100	212—216	..	3 9 5
544,440	"	27 June	4½	Do. 4½ p. c. Deb. Stk.	100	142—147	..	3 1 2
700,000	50	13 June	9	Grand Junction	50	120—124	..	3 12 7
708,000	Stck.	14 Aug.	10½	Kent	100	270—275	..	3 16 4
1,043,800	100	27 June	9½	Lambeth, 10 p. c. max.	100	249—254	+1	3 14 9
406,200	100	"	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	122—126	..	3 3 6
500,000	100	14 Aug.	12½	New River, New Shares	100	361—366	..	3 6 3
1,000,000	Stck.	31 July	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 6
902,300	Stck.	13 June	6	S'thwk & V'xhall, 10 p. c. max.	100	170—174	..	3 9 0
126,500	100	"	6	Do. 7½ p. c. do.	100	158—163	..	3 13 7
1,155,066	Stck	13 June	10	West Middlesex	100	265—270	..	3 14 1

† Next dividend will be at this rate.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." TELEPHONE No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 29,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAYS.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

JOHN RILEY & SONS, Chemical Manu-facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house 17, NEWTON STREET, PICCADILLY, MANCHESTER.

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890: Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

WANTED, by a thoroughly Competent man, a SITUATION as SERVICE LAYER, METER FIXER, INDEX READER, MAIN TESTER, &c. Thorough practical experience in general outside work. First-class Testimonials.
Address A.B., 16, Station Street, Stratford, E.

WANTED, a Situation as Fitter. Well up in Iron and Compo., Heating and Cooking Stoves, Main and Service Laying, Index Taking, and Meter Fixing. Eight years at a Gas-Works. Good References.
Address No. 1854, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ERECTION OF TAR PLANT.

A GAS ENGINEER (Member of The Gas Institute) having had considerable experience in the ERECTION OF PLANT for the FRACTIONAL DISTILLATION and RECTIFICATION OF COAL TAR, is now prepared to undertake such erection for Gas-Works, and also give Instructions to Work the same when complete.
Letters to be addressed to No. 1856, care of Mr. King, 1, Bolt Court, FLEET STREET, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 480 of last week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

SULPHURIC ACID delivered in Manu-facturers' Tanks or Carboys.
Prices on application to HARDMAN and Co., Miles Platting, MANCHESTER.

ADVERTISER (aged 28) desires an appointment as SECRETARY or ACCOUNTANT to a Gas Company. Home or Colonies. Eight years in present post. First-class Accountant. Highest References.
Address No. 1855, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good reliable Smith, accustomed to work on a Gas-Works. Must have good References.
Address No. 1858, care of Mr. King, 11, Bolt Court FLEET STREET, E.C.

WANTED, a Man, who can undertake the GAS-FITTING, MAIN AND SERVICE LAYING, INDEXING, and GENERAL REPAIRS to Gas Plant and Tools. One with a knowledge of Gas-Engines preferred. Wages 23s. per week.
Apply to Mr. GORDON WALKER, Manager, Gas-Works, WANTAGE.

GAS-FITTER, ETC.

WANTED, by the Crays Gas Company, a thoroughly competent GAS-FITTER, SERVICE and MAIN LAYER, METER INSPECTOR, &c. A Man capable of doing Smith's Work, and repairing Tools preferred.
Applications, by letter only, stating age, previous employment, and wages required, to be addressed to Mr. F. M. EDWARDS Gas-Works, St. Mary Cray, KENT.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. See large Advertisement, p. 572.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

TAR and Liquor wanted.
BROTHERTON AND Co., Commercial Buildings, LEEDS.

WANTED, to purchase Gas Carbon, delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating price per ton and quantity, No. 1766, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—One Single Gasholder, 80 feet by 20 feet (owing to extensions at Blackpool). To be erected complete; in first-rate condition.
Apply to CLAYTON, SON, AND Co., LIMITED, Hunslet, LEEDS.

FOR IMMEDIATE SALE—A small GAS PLANT, for private use. To be seen, fixed complete, in the neighbourhood of Warrington.
Apply, by letter, to No. 1852, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SUTTON-IN-ASHFIELD LOCAL BOARD.

(GAS DEPARTMENT.)

SUPPLY OF GAS COAL.

THE Gas Committee of the above Local Board are prepared to receive TENDERS for the supply of 1100 tons of well-screened GAS COAL, to be free from Shale and Pyrites, and to be delivered at the Railway Station, Sutton, in such quantities as the Manager shall from time to time direct, between Jan. 1, and June 30, 1891.
Particulars may be obtained on application to the Manager at the Gas-Works, Sutton-in-Ashfield, Notts.
Tenders, stating price, to be addressed as above, and marked "Tender for Coal," so as to arrive not later than Tuesday, the 30th of September, 1890.
By order,
G. H. HIBBERT,
Clerk to the Committee.
Local Board Offices, Sutton-in-Ashfield, Notts.

PENRYN, CORNWALL.

VALUABLE GAS-WORKS IN THE BOROUGH OF PENRYN FOR SALE, TO CLOSE A TRUST ACCOUNT.

MR. THOMAS GILL has been favoured with instructions from the Executors of the late Thomas Bennett, Esq., to SELL BY PUBLIC AUCTION, at Chapman's King's Arms Hotel, Penryn, on Monday, Sept. 15, at Four o'clock in the Afternoon, subject to such conditions as will be there and then read, the following valuable

GAS WORKS:

Consisting of Retorts and Condensers recently erected, Two Gasholders, large Meter for Works, Drawers, Scurfing-Bars, Levellers, Shovels, Picks, Gurries, Wheelbarrows, Tongs, Clinking-Bars, Fire and Arch Bricks, Syphon Pumps, Forcing Pumps, Bends, new and old Iron Pipes, Brass Taps, &c.; 39 Public Lamps on Iron and Wood Posts; 60 Meters on Rental from 3 to 20 lights; 4393 yards of Main Pipes, consisting of 454 yards of 5-inch, 2681 yards of 2-inch, 425 yards of 1¼-inch, 532 yards of 1-inch, 200 yards of ¾-inch, and 100 yards of ½-inch.

The Gashouse, Yard, and Premises are situate in the Parish of Budock, adjoining the Borough of Penryn, and are held under a lease from the Duke of Leeds, dated the 21st day of February, 1837, for 99 years, determinable on the death of one life now aged 65 years, under a high rent of 10s., and a heriot of 10s., payable on the death of the said life.

A printed inventory with full particulars will be ready for delivery a week previous to the Sale.

The purchaser will be required to take at a valuation, to be made in the usual manner, the Coal, Coke, and Tar, that may be on the premises on the 29th of September, 1890.

To view the Works application must be made to Mr. W. S. Olver, jun., Market Strand, Falmouth; and for further particulars, apply to the Auctioneer, Market Street, Penryn; or to

Mr. WILLIAM JENKINS,
Solicitor.

Falmouth, Aug. 22, 1890.

BOROUGH OF HEYWOOD.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Heywood Gas Committee are pre- pared to receive TENDERS for the Surplus TAR produced at their Works during the ensuing year, and also for the supply of SULPHURIC ACID, suitable for the Manufacture of Sulphate of Ammonia, during the same period.

Particulars and forms of tender may be obtained on application to the Manager, Mr. W. Whatmough.

Sealed tenders, marked "Tar," or "Sulphuric Acid," as the case may be, to be sent to me not later than Tuesday, the 16th of September inst.

By order,
ALFRED WALLIS, Town Clerk.

Municipal Buildings, Heywood,
Sept. 4, 1890.

TENDERS FOR TAR.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the purchase of the surplus TAR they will have for disposal during the Twelve months ending Sept. 30, 1891—namely about 1800 tons—to be divided into Three Contracts of 600 tons each.

The Company will probably dispose of the total surplus of approximately 1800 tons in One, Two, or Three Contracts as the Board may decide; but they do not bind themselves to accept the highest or other Tender or Tenders.

Tenders must be addressed to the Chairman of the Finance Committee of the Derby Gaslight and Coke Company, Friar Gate, Derby, endorsed "Tender for Tar," and delivered on or before Tuesday, the 23rd day of September, 1890.

Further particulars may be had on application.

By order of the Directors,
RICHARD FISHER,
Secretary.

Derby Gas Office, Sept. 4, 1890.

THE Hornsey Gas Company have for SALE Two Cast-Iron TOWER SCRUBBERS—one 7 ft. 6 in. diameter by 30 feet high, and the other 10 feet diameter by 40 feet high—in good condition.

Full particulars can be obtained at the GAS-WORKS, Clarendon Road, HORNSEY, N.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors of the Wandsworth and Putney Gaslight and Coke Company are prepared to receive TENDERS for the supply of 40,000 tons of clean, dry, unscreened, fresh-wrought GAS COALS, delivered in covered Barges alongside the Company's Works at Wandsworth in the River Thames.

The Coal to be delivered from time to time in quantities as required by the Company's Engineer, and to extend over Twelve months ensuing, from or about the end of September.

Payment by Cash monthly.

Other particulars can be obtained on application to the Company's Engineer.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, sealed, and endorsed "Tender for Coals," to be addressed to the Chairman of the Company, and delivered at the Company's Offices not later than the 15th of September.

By order,
WALTER CROMARTY, Secretary.

orth Street, Wandsworth, S.W.

BOROUGH OF BURTON-UPON-TRENT.

OXIDE OF IRON.

THE Gas and Electric Light Committee of the Burton-upon-Trent Corporation are prepared to receive TENDERS for the supply of from 200 to 250 tons of OXIDE OF IRON for Gas Purification, to be delivered in Railway Company's Trucks at the Gas-Works Railway Siding, Burton-upon-Trent, in such quantities and at such times as may be directed by their Manager.

Persons tendering are requested to state whether the Oxide they offer is a Natural or Artificial one.

Terms of payment: Net cash, monthly.

Tenders, enclosed in an envelope, and endorsed "Tender for Oxide of Iron," are to be delivered to the undersigned at or before Ten a.m., on Wednesday, the 24th of September inst.

The Committee reserve to themselves the right of rejecting the lowest or any tender.

F. L. RAMSDEN,
Manager and Engineer.

Gas-Works, Burton-upon-Trent,
Sept. 5, 1890.

HARTLEPOOL GAS AND WATER COMPANY.

TO IRONFOUNDERS, ETC.

THE Directors of the above Company are prepared to receive TENDERS for the several Works and Materials required in the construction of a WATER-TANK, 17 ft. 9 in. in height, and 60 feet square, internal measurement, together with built and rolled GIRDERS for supporting the same on Tower of Masonry 82 ft. 8 in. in height; also CAST-IRON COLUMNS, INLET, OUTLET, and OVERFLOW PIPES, STRUTS, STAYS, BOLTS, &c., &c., and a WROUGHT-IRON ROOF, 60 feet span, covered with Corrugated Iron.

Plans and Specification may be seen, or any further information obtained, on application to the Company's Engineer, Mr. Thomas Bower, who, if desired, will supply copies of the plans.

Tenders on form prescribed, and sealed and endorsed "Tender for Water-Tank," to be sent to Mr. Thomas Trewhitt, Secretary, Gas and Water Company, West Hartlepool, not later than Wednesday, the 1st day of October next.

The Directors do not bind themselves to accept the lowest or any tender.

By order of the Directors,
THOMAS TREWHITT, Secretary.

Gas and Water Company's Offices,
West Hartlepool, August, 1890.

HOLMSIDE GAS COALS.

THE Owners of Holmside and South Moor Collieries possess an undivided area of nearly 5000 acres of COAL in the County of Durham, over the greater portion of which area the most of the best Coal of the district, including the well-known Hutton Seam, remains almost untouched; and as preparations are being made for working the Hutton Seam on a large scale, it is expected that the reputation of HOLMSIDE GAS COALS will be still further increased. The Holmside and South Moor Collieries have been in the hands of the same families for over half a century; but, until lately, no adequate attempt has been made to open out their very large Coal-Field, notwithstanding that the best Coal of the district around them, and especially the Hutton Seam, has been for some time past seriously diminished by reason of the vigorous workings of neighbouring coal-owners. Holmside Gas Coals are now being worked out of Holmside and South Moor Collieries at a rate of about 2200 tons per working day—a rate totally inadequate to meet the existing demand. By an extensive development of workings in the Hutton Seam, it is hoped that the demand may be fully met, and the quality raised to the highest point attainable by Durham Coal.

For price and particulars, apply to MARK ARCHER, Holmside and South Moor Offices, Quayside, NEWCASTLE-ON-TYNE.

BOROUGH OF DARWEN.

SULPHURIC ACID.

THE Gas Committee are prepared to receive TENDERS for 100 tons of SULPHURIC ACID, to be delivered in Railway Tanks during the next Twelve months.

Tenders, endorsed "Sulphuric Acid," to be sent to C. Costeker, Esq., Town Clerk, Darwen, on or before Thursday, the 18th inst.; but full particulars of the kind, quality, and strength to be previously sent to

THOS. DUXBURY,
Manager.

Gas-Works, Darwen, Sept. 5, 1890.

CORPORATION OF LEICESTER.

(WATER-WORKS DEPARTMENT.)

QUORNDON AND BARROW-UPON-SOAR WATER SUPPLY.

THE Water Committee are prepared to receive TENDERS for EXCAVATING PIPE TRENCHES, LAYING MAINS, and REFILLING TRENCHES for the supply of Water from a temporary Pumping Station on the intended site of the Swithland Reservoir, along the public footpath to Quorndon village, and from thence along the public road to the village of Barrow-upon-Soar.

Plans may be seen, and forms of tender, with specification and quantities, obtained at the Water-Works Offices, on payment of £1, which will be returned on receipt of a *bond fide* tender.

Sealed tenders, upon the forms supplied, will be received up to noon on Monday, the 15th inst., addressed to the Chairman of the Water Committee, Water-Works Offices, Bowling Green Street, Leicester.

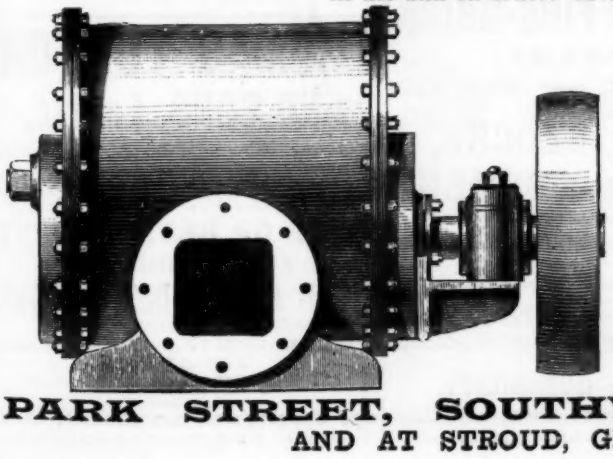
The Water Committee do not bind themselves to accept the lowest or any Tender.

F. GRIFFITH, M. Inst. C. E.,
Engineer and Manager.

Water-Works Office, Bowling Green Street,
Leicester, Sept. 1, 1890.

G. WALLER & CO.'S
PATENT FOUR AND THREE BLADE GAS EXHAUSTERS.

With or without Engine combined. To pass up to 300,000 cubic feet per hour. Nearly 200 in use and on order. Model sent for inspection.



SPECIAL ADVANTAGES.

1. It gives a more **steady gauge** at all speeds than any other Exhauster.
2. It will deliver fully **one-third more** per revolution than the Beale Exhauster.
3. It has not any **Segments or Rings** to cause friction.
4. The Cylinder being a **circle** and the blades **radial from the centre,** it can be driven at a higher speed than any other Exhauster.
5. No **heavy Fly-Wheel** needed; and **one-third less** power required.
6. The **only system** by which Exhausters **can be altered** to pass from **30 to 40 per cent.** more with same Driving Gear and Connections.

Oldest Makers of BEALE'S EXHAUSTERS for 300 Works.

SPECIALITY—Elevating and Conveying Machinery for Coal, Coke, Oxide, Lime, &c.

PARK STREET, SOUTHWARK, LONDON, S.E.,
AND AT STROUD, GLOUCESTERSHIRE.

OLDBURY LOCAL BOARD.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply, during Six or Twelve months, of 3000 or 6000 tons of screened GAS COAL.

Tenders, endorsed "Gas Coal," to be sent in not later than Tuesday, the 16th inst., to the undersigned, from whom any further information may be obtained.

By order,
C. MEIKLEJOHN, Manager.

Sept. 8, 1890.

BRIDGNORTH CORPORATION GAS-WORKS.

TENDERS FOR SURPLUS TAR.

THE Gas Committee hereby invite TENDERS for the purchase of the surplus TAR (about 100 tons) produced at these Works during One year from the commencement of the contract.

The Tar will be delivered on Rails at Bridgnorth Station in the Contractor's tanks.

Sealed and endorsed tenders to be sent to the undersigned not later than Sept. 12.

Neither the highest nor any tender will necessarily be accepted.

By order,
J. H. COOKSEY, Town Clerk,
Secretary.

Bridgnorth, Aug. 22, 1890.

THE BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is hereby given that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 24th inst., at half-past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and one Auditor in the place of those who go out by rotation, but who are eligible to be re-elected.

Notice is hereby also given, that the Transfer Books of the Company will be closed on the 13th inst., and re-opened on the 25th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 3, 1890.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

THE Committee request those desirous of ADVERTISING in the ANNUAL REPORT OF PROCEEDINGS, 1890, to apply for space to the Secretary.

Rates: Full Pages, 21s.; Half-Page, 12s. 6d.

Priority of insertion will be given according to the order in which applications are received.

ROBT. S. CARLOW, Secretary.
CORPORATION GAS-WORKS, ARBROATH,
Sept. 6, 1890.

Fcap. 4to, Cloth, Gilt Lettered, numerous Illustrations, price 7s. 6d., post free.

Practical Photometry:

A GUIDE TO THE STUDY OF THE

MEASUREMENT OF LIGHT.

By William Joseph Dibdin, F.I.C., F.C.S.,

Chemist and Superintending Gas Examiner to the London County Council,

Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

London: WALTER KING, 11, Bolt Court, FLEET ST., E.C.

Price 6s., Cloth Bound, Bevelled Boards,

THE

GUIDE-FRAMING OF GASHOLDERS

AND OTHER PAPERS

CHIEFLY RELATING TO

STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.

BY

F. SOUTHWELL CRIPPS, Assoc. M. Inst. C.E.

Reprinted from the JOURNAL OF GAS LIGHTING. *Fully Revised and Corrected by the Author, with many Additions.*

LONDON:
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

PREPARED OXIDE OF IRON

FOR PURIFYING COAL GAS.

As extensively used in Yorkshire, Lancashire, the Midlands, and Abroad.

Manufacturers: BAILES & HALLSWORTH,

Armley, Leeds, & at Bradford, Manchester.

SOOTHILL WOOD CANNEL.

Yield of Gas per Ton, over 12,000 Cubic Feet.
Illuminating Power - - - - - 26 Candles.
Coke per Ton, - - - - - - - 57 per cent. of a quality almost equal to that made from the best Coking Coal.

For Analysis and Price, apply to

The Soothill Wood Colliery Co., Ld.,

SOOTHILL WOOD COLLIERY,

BATLEY, YORKSHIRE.

THE BEST AND SIMPLEST SYSTEM OF

VALVES FOR PURIFIERS

Is Weck's Patent arrangement of Three-Way Disc Valves, either separate for Purifiers fixed in line, or arranged together as a

CENTRE-VALVE

When the Purifiers are fixed in square.

No Leakage. No Foul Gas passed in changing. All the Purifiers in action, or any less number. Clean Box emptied of Air before taking into use.

DESCRIPTIVE PAMPHLET ON APPLICATION.

F. WECK,

JOHN BRIGHT ST., BIRMINGHAM.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

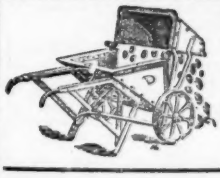
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

NOTE ALTERATION OF ADDRESS.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

JAMES NEWTON & SONS,
(Established 1820)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY and every Article suitable for

GAS AND WATER WORKS.

PATENTS FOR INVENTIONS,

REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

J. C. CHAPMAN,

Assoc.M.Inst.C.E., M.Inst.M.E., Fel. Inst. Patent Agents,

70, CHANCERY LANE, LONDON, W.C.

Special experience in Gas and Ammonia Plant.

A WARM BATH IN TEN MINUTES.
(*COST OF GAS*, 1d.)

The New Patent

"CALDA."

NO CONTACT OF GAS WITH WATER.
NO SMOKE, SMELL, OR RISK.

G. SHREWSBURY,
36, Gray's Inn Rd.
(Late 122, Newgate St.)

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

THOMAS TURTON AND SONS, LIMITED,

Sheaf & Spring Works,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

PARIS DEPÔT: 3, BOULEVARD DE BELLEVILLE.

G. E. TOURNAY,
Contractor for the Erection and Re-Building of
GAS-RETORT SETTINGS,
CHIMNEY SHAFTS,
FURNACES, & BOILER SETTINGS,
THANNINGTON, CANTERBURY.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

— THE —
Grassmoor Company, Ltd.,
CHESTERFIELD,
Have still a limited quantity of their
HEATHCOTE
GAS COAL
In Reserve.
ANALYSIS AND SAMPLES ON APPLICATION.

GAS AND WATER PIPES.
½ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.
ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.
GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"BONLEA, STOCKTON-ON-TEES."
"SPRINGBANK, GLASGOW."

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

NEWBATTLE CANNEL.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

CAST-IRON PIPES
FOR GAS AND WATER.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.
Quotations and Analysis on application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

FIRE-BRICKS. FIRE-CLAY.
JAMES WHITE & CO.,
Albert Oil-Works,
WIDNES, LANCASHIRE.
Sole Proprietors of the Largest and Purest Beds of Fire-Clay in England.
FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the market.
GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest and Finest Quality.
ANALYSIS AND REFERENCES ON APPLICATION.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO. 21, John St., Adelphi, LONDON, W.C.

Is now Ready, the Fifth Edition of the
HANDBOOK
FOR
Gas Engineers and Managers.
BY
THOMAS NEWBIGGING,
Member of the Institution of Civil Engineers.
PRICE: MOROCCO, GILT, 18s.; CLOTH, 15s.; DELIVERED FREE.
LONDON:
WALTER KING, "JOURNAL OF GAS LIGHTING," ETC., 11, BOLT COURT, FLEET STREET, E.C.

AUTOMATIC COAL-GAS RETORTS.

GOLD MEDAL, PARIS EXHIBITION, 1889.

THE CHIEF ADVANTAGES CLAIMED FOR THIS PROCESS MAY BE SUMMARIZED AS FOLLOWS:—

1. **No skilled labour required.**
2. **Wear and tear of carbonizing tools reduced 50 per cent.**
3. **Great reduction in erection of Ascension-Pipes and Hydraulic Mains.**
4. **Coal carbonized one-sixth quicker than by the old process.**
5. **Absolute control of production by unskilled labour.** (This is most important, especially when there is an extra demand for Gas, as in the case of foggy days, &c.)
6. **Fifty per cent. saving in space of permanent Buildings, thus enabling an old Retort-House fitted by this System to manufacture twice the quantity of Gas.**
7. **This System enables the whole of the old Retorts, Doors, Fittings, &c., to be used (if required) where the Morris and Van Vestraut's latest improvements are adopted.** (These improvements were described by Mr. Van Vestraut in his Paper read at the last meeting of The Gas Institute. See JOURNAL for July 8.)
8. **The Morris and Van Vestraut's System effects a reduction in the cost of carbonizing from 40d. to 10d. (average London prices) per ton of coal, or a saving of more than 70 per cent. in cost of labour.**

This System of Automatically Charging and Discharging Retorts, without machinery or arduous labour, is being largely adopted at the Works of The Gaslight and Coke Co., the South Metropolitan Gas Co., and the Brentford Gas Co., and of several of the Provincial Gas Companies and Corporations.

This Process is fully Patented, and any Infringer will be strictly proceeded against.

For further particulars apply to W. M. KIGHT, Secretary, AUTOMATIC COAL-GAS RETORT COMPANY, LTD., 86 and 88A, LEADENHALL STREET, LONDON, E.C. [See Illustrated Advt., p. 516.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL.

Address, THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF

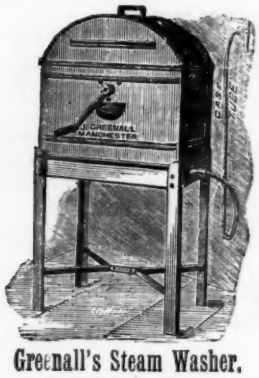
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.

BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c.; AND OF WARNER'S PATENT MARKET GAS STAND-PIPE.

LONDON: T. LAMBERT & SONS, Short Street, LAMBETH.

IMPORTANT TO GAS COMPANIES.

Hiring out Specialities for Gas Consuming.



Greenall's Steam Washer.
(ORIGINAL PATENT.)

Companies desirous of extending the use of Gas should see the "GREENALL" WASHING MACHINE. The Washer is admirably adapted for domestic purposes, and will execute the work in one-third the time occupied by any other system of washing clothes, while the labour is almost nil. To Laundrymen, the Machine is invaluable.

By removing the Cylinder, the Outer Tank can be utilized for Boiling Water, or for Hams, Puddings, &c., &c., and the Burner is adapted for Heating Flat Irons.

Particulars, with Testimonials and Terms, on application to the Manufacturer,

JOHN GREENALL, 120, Portland Street,

MANCHESTER.

The Gas Washing Machine can be seen at the Royal Military Exhibition, Chelsea.

THE "CAMPBELL" GAS-ENGINE.

PERFECT SIMPLICITY OF CONSTRUCTION.

Thorough Economy in Working.

REGULARITY IN SPEED.

Latest Improvements.

Give unequalled results.

Sole Makers: **The CAMPBELL GAS-ENGINE CO., Ld., Halifax, YORKS.**

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

INCANDESCENT GAS-LIGHT (NEW AND IMPROVED SYSTEM).

ELECTRIC LIGHT SURPASSED.

All the advantages of the Electric Light and none of its drawbacks.

EVERY GAS COMPANY SHOULD TAKE UP THIS SYSTEM.

CAN BE USED WITH ANY GAS-FITTINGS.

ONE-FOURTH THE COST OF ELECTRIC LIGHT.

A SOFT, CLEAR, STEADY LIGHT.

NO SMOKE. LESS HEAT.

Gas Companies and Gas Engineers placed on the best terms. For descriptive circulars and any further particulars, apply to the

INCANDESCENT GAS-LIGHT CO., Ld., 14, Palmer St., Westminster, LONDON.

THE VERY

VALUABLE PATENTS

GRANTED TO

MESSRS. GADD & MASON

(For entirely dispensing with the external guide-framing of Gasholders, thereby reducing the cost of construction enormously)

TO BE SOLD,

Or licenses granted on royalty for the following Countries, viz :—

France, Germany, Belgium, United States, Canada, Australia, Italy, Spain, Portugal, Luxembourg, Denmark, Norway, Sweden, Turkey, Russia, Brazil, India, Cape of Good Hope, Natal, Victoria, New South Wales, South Australia, Queensland, Western Australia, New Zealand, and Tasmania.

For those Firms desirous of securing a large business, the acquisition of these Patents would practically give a monopoly of the Gasholder Trade in the above Countries.

ADVANTAGES:

IMMENSE SAVING IN COST. NO COLUMNS. NO FRAMING.

TANK CONSTRUCTION MUCH CHEAPER AND EASIER.

Large saving in Carriage, Freight, Haulage, and Insurance.

ADMITTED by EMINENT ENGINEERS to be the SYSTEM OF THE FUTURE.

Telegrams: "SPIRAL MANCHESTER."

THE PATENT GASHOLDER SYNDICATE,

504, STOCKPORT ROAD, MANCHESTER.

D. HULETT & CO., LTD.,

GAS ENGINEERS,

55 & 56, HIGH HOLBORN, LONDON,

Manufacturers of every description of Gas-Fittings.

HIGH-POWER LAMPS

Of every description, fitted with Copper Tops, Porcelain Cones, and Regulating High-Power Burners.

HULETT'S PATENT

STREET LAMPS.

No putty required.
Glass secured by hinged clips. No loose parts.
A new pane of glass can be fitted in a few minutes by any inexperienced person.
Glass can be supplied cut ready for use.
The frames are not liable to be damaged as in ordinary lamps when hacking out a broken pane of glass.
The glass can be removed for repainting.
Several thousands of these are now in use, giving general satisfaction.
They are strongly made, and of the best material.

HULETT'S IMPROVED

SERVICE CLEANSER

For Removal of Obstructions in Gas Service Pipes.

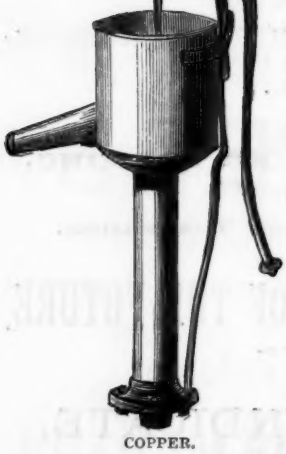
They are constructed with Air Vessels of great strength and capacity for storing a large quantity of air, which can be delivered at a pressure of 150 lbs. if necessary.

They are also fitted with Water Fittings, so that about a gallon of liquid can be discharged with the air, for removing Naphthalene from the interior of tubes.

WET AND DRY GAS-METERS.

GAS PRESSURE GAUGES.

WROUGHT OR CAST IRON TUBES AND FITTINGS.



COPPER.

BRASS.

SYPHON PUMPS,

In Iron, Brass, and Copper.

IRON.

CAST-IRON SYPHONS FOR MAINS.

LAMP-POSTS.

CRADLES AND BRACKETS.

— PRICE LISTS UPON APPLICATION. —

JAMES D. PERKINS. F. SEAVERNS.

PERKINS & Co.,

228 & 229, PRODUCE EXCHANGE, NEW YORK.

Cable Address: "PERKINS, NEW YORK." *Post Office Box 3695, New York.*

SOLE AGENTS FOR THE CELEBRATED

BRECKENRIDGE CANNEL

AND THE

OLD KENTUCKY BOGHEAD

OF KENTUCKY, U.S.A.

These Cannels will rank with the Australian Shale for Gas Manufacture.

Also General Sales Agents for

PENNSYLVANIA & VIRGINIA GAS COALS, & AMERICAN FOUNDRY & FURNACE COKE.

Delivery Prices made to any Port in

GREAT BRITAIN, ON THE CONTINENT, OR SOUTH AMERICA.

Full Information furnished upon Application to the above Address.

FACE YOUR RETORT MOUTHPIECES.

JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

PATENT TWISTED TAPS, DIES, & CUTTERS.

Thousands in constant work, give universal satisfaction.

Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

Main Drilling Stand, with Cup Drills, 1¼ to 6 inch; Taps, Rymers, and Drills.

Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides &c.

Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

ROOTS' PATENT "ACME"

GAS EXHAUSTERS.

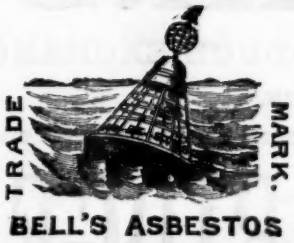
POSITIVE IN ACTION. SIMPLE IN CONSTRUCTION. DURABLE & SOLID IN DESIGN.

All Working Parts external and unaffected by Gas.

SOLE LICENSEES under Roots' Latest Patents,

SAMUELSON & CO., LTD., BANBURY, OXON.

BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40 PER CENT.** GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

BELL'S ASBESTOS COMPANY, LIMITED,

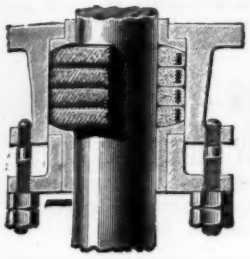
SOUTHWARK, LONDON, S.E.

DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. AMSTERDAM: 264, N. Z. Voorburgwal. BERLIN, BARCELONA, and ANTWERP.
AGENTS—BIRMINGHAM: BELL and Co., 7, John Bright Street. CARDIFF: BELL and Co., West Bute Street.

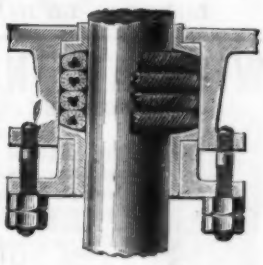
BELL'S ASBESTOS DAGGER

PACKING

PATENT No. 15,498.



ROUND



SQUARE. Every 10 feet has Label as above, and bears our Trade Mark.

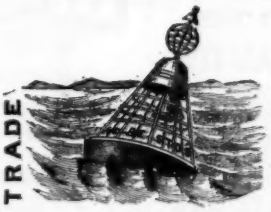
Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest types. The packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases

IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.

MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
GLASGOW: 35, Robertson Street.
DUBLIN, BERLIN.



DEPÔTS.

AMSTERDAM: 264 N. Z. Voorburgwal,
BARCELONA, and ANTWERP.

AGENTS.

BIRMINGHAM: BELL and Co., 7, John Bright Street.
CARDIFF: BELL and Co., West Bute St.

SOUTHWARK, BELL'S ASBESTOS. LONDON, S.E.

BELLS ASBESTOS

YARN AND SOAPSTONE PACKING

Is the BEST LOCOMOTIVE PACKING made.

BELL'S

COMPOUND HYDRAULIC PACKING

Is specially suited for Hydraulic Machinery, Accumulators and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT

Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.

BELL'S ASBESTOLINE

The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS

EXPANSION SHEETING

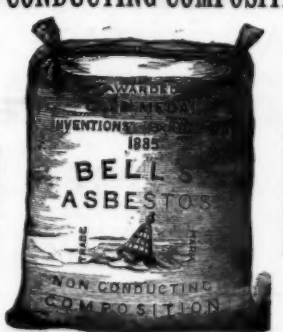
RINGS, AND TAPE.

Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.

BELL'S ASBESTOS

NON-CONDUCTING COMPOSITION.

Will reduce loss by radiation and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



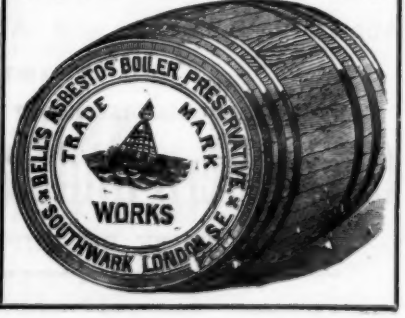
Can be applied again after many years' service. Is sent out dry, in bags; therefore cheaper than other sorts in wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS

BOILER PRESERVATIVE

Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



HENRY BALFOUR & CO.,

LEVEN, FIFE,

MAKERS OF

GASHOLDERS

And all classes of GAS PLANT,

REVOLVING BRUSH SCRUBBERS, FOUR-WAY VALVES.

LONDON: 13, BILLITER STREET, E.C.

WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of **LYON'S 'PATENT' GAS MAIN SYPHONS,**

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES,

153 TO 155, CANNON STREET,

LONDON BRIDGE, E.C.

TELEGRAPHIC ADDRESS "GAS LEEDS."

CLAYTON, SON, & Co.

LIMITED,

LEEDS,

MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES

IN IRON OR STEEL

BY SPECIAL HYDRAULIC MACHINERY.

LONDON OFFICE: 60, QUEEN VICTORIA STREET, E.C.

PRICES ON APPLICATION.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

Head Office: CORPORATION STREET, BIRMINGHAM.

HANNA, DONALD, & WILSON

(Established 1851),

GAS ENGINEERS & CONTRACTORS,

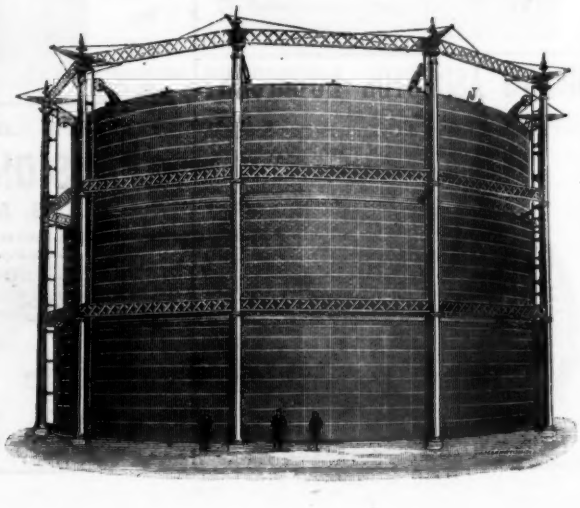
Abercorn Foundry and Abbey Works,

PAISLEY, N.B.,

MAKERS OF

Gasholders and Gas Plant

OF EVERY DESCRIPTION.



Telegraphic Address: "Donald Paisley."

WASHER-SCRUBBER and WATER TUBE,

SLOW-SPEED CONDENSER

(Kelman's English & American Patents).

These Apparatus are in use at the Gas-Works at Lincoln, Mountain Ash, Neath, Ellesmere (Salop), Woodstock (Cape Town); and
Two large CONDENSERS, capable of dealing with **4,000,000** cubic feet of Gas per day have recently been erected at the Gas-Works at Sheffield. A large CONDENSER is also being erected at the Montreal Gas-Works.

PERFECT CONDENSATION. NO POWER REQUIRED.

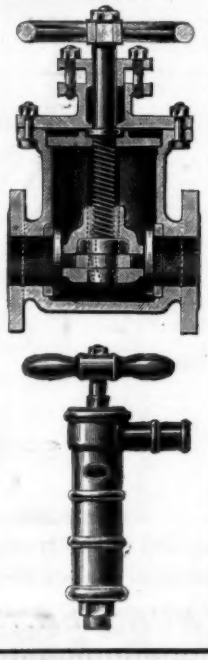
For Prices and further Information, apply to

J. A. KELMAN, WINCHESTER HOUSE, LONDON, E.C.

W. H. SPENCER & CO.,

HITCHIN, HERTS,

— ENGINEERS. —



PATENT CAM FULL-WAY

VALVES,

1 INCH to 8 INCHES,

Instantaneous Grip and Release, occupying less Space than any other Full-Way Valve; made with either Internal or External Spindle. Gun Metal or Phosphor Bronze Valves, Seats, and Spindles.

Prices on Application.

CAST-IRON SYPHON PUMPS.

2½ by 6 in. Stroke - - £1 10 0 each.
2½ by 9 in. „ - - £1 16 0 „

WROUGHT-IRON DITTO.

2½ by 6 in. Stroke - - £1 13 6 each.
2½ by 9 in. „ - - £1 19 6

NET.

THE

ÉTOILE GAS-LAMP

(REGENERATOR).

Sole Makers and Proprietors,

THE ÉTOILE GAS-LAMP COMPANY,

Gas Lighting and Ventilating Engineers,

PRINCESS STREET, **MANCHESTER.**

S. PONTIFEX & CO.,

GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS

LANTERN COCKS, REGULATORS.

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT

LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

BOX'S PATENT

PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.

Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

THE MOST RELIABLE STANDARD OF LIGHT

IS

HARCOURT'S

STANDARD

"PENTANE" LAMP.

No. 2.—Improved Type,

AS USED BY

Mr. Dibdin, Mr. Heisch, Liverpool United Gas Company, The Hague Gas-Works, The Leyden Gas-Works, Alex. Wright & Co., Stafford Corporation Gas-Works, Negretti and Zambra, Mr. Frank Livesey, Mr. Jas. Swinburne, Winfields Limited, &c., &c.

Prices, &c., from

IS

HARCOURT'S

STANDARD

"PENTANE" LAMP.

No. 2.—Improved Type,

AS USED BY

The Admiralty, the United States Government, Chinese Government, Cie. Parisienne du Gaz, Dublin University, Harvard University, Owen's College, Manchester, Lord Rosse, Mr. W. H. Preece, Imperial Technical Institute, Berlin, &c., &c.

Prices, &c., from

Woodhouse & Rawson

UNITED, LIMITED,

88, QUEEN VICTORIA STREET, LONDON, E.C.

W. PARKINSON & CO.,

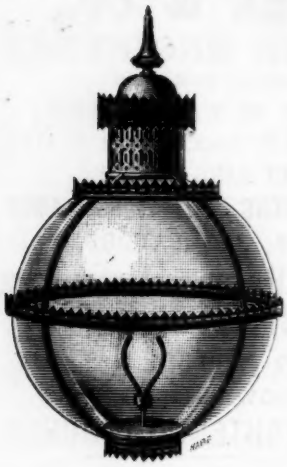
Having purchased the old-established Lamp and Meter Business of

MESSRS. JOHN BENT & SON,

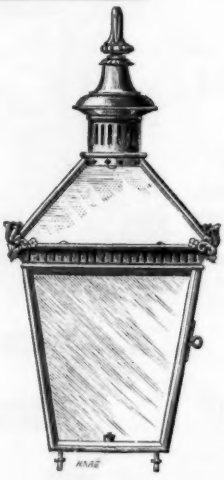
Are now Manufacturers of

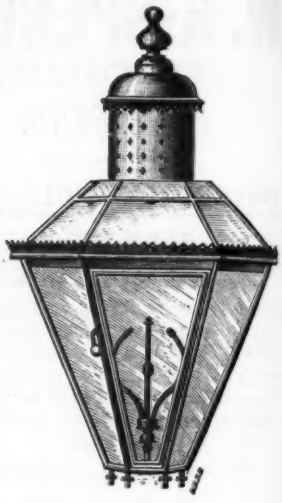
IMPROVED LAMPS FOR STREET LIGHTING

IN EVERY SIZE AND STYLE.



STREET LAMP METERS.
LAMP COCKS.





LAMPLIGHTERS' TORCHES.

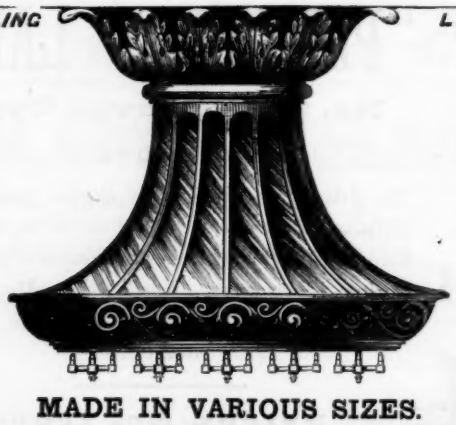
Our long experience in all branches of work connected with Street Lighting enables us to supply goods of the most improved construction, and of the highest quality.

PATTERN SHEET AND REFERENCES SENT ON APPLICATION.

ALSO SOLE MAKERS OF

HUNT'S PATENT
SUN-BURNER OR VENTILATING CEILING LIGHT.

CEILING LINE



HIGHEST ILLUMINATING POWER AND PERFECT VENTILATION.

ESTIMATES SUBMITTED FOR LIGHTING BUILDINGS OF ANY DIMENSIONS.

VENTILATING FLUES SUPPLIED AND FIXED COMPLETE.

EXTENSIVELY IN USE IN PUBLIC OFFICES, CHURCHES, HALLS, ETC.

ECONOMICAL IN FIRST COST AND VERY DURABLE.

MADE IN VARIOUS SIZES. TESTIMONIALS ON APPLICATION.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."

[See also Advt., p. 534.

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Sept. 9, 1890.